



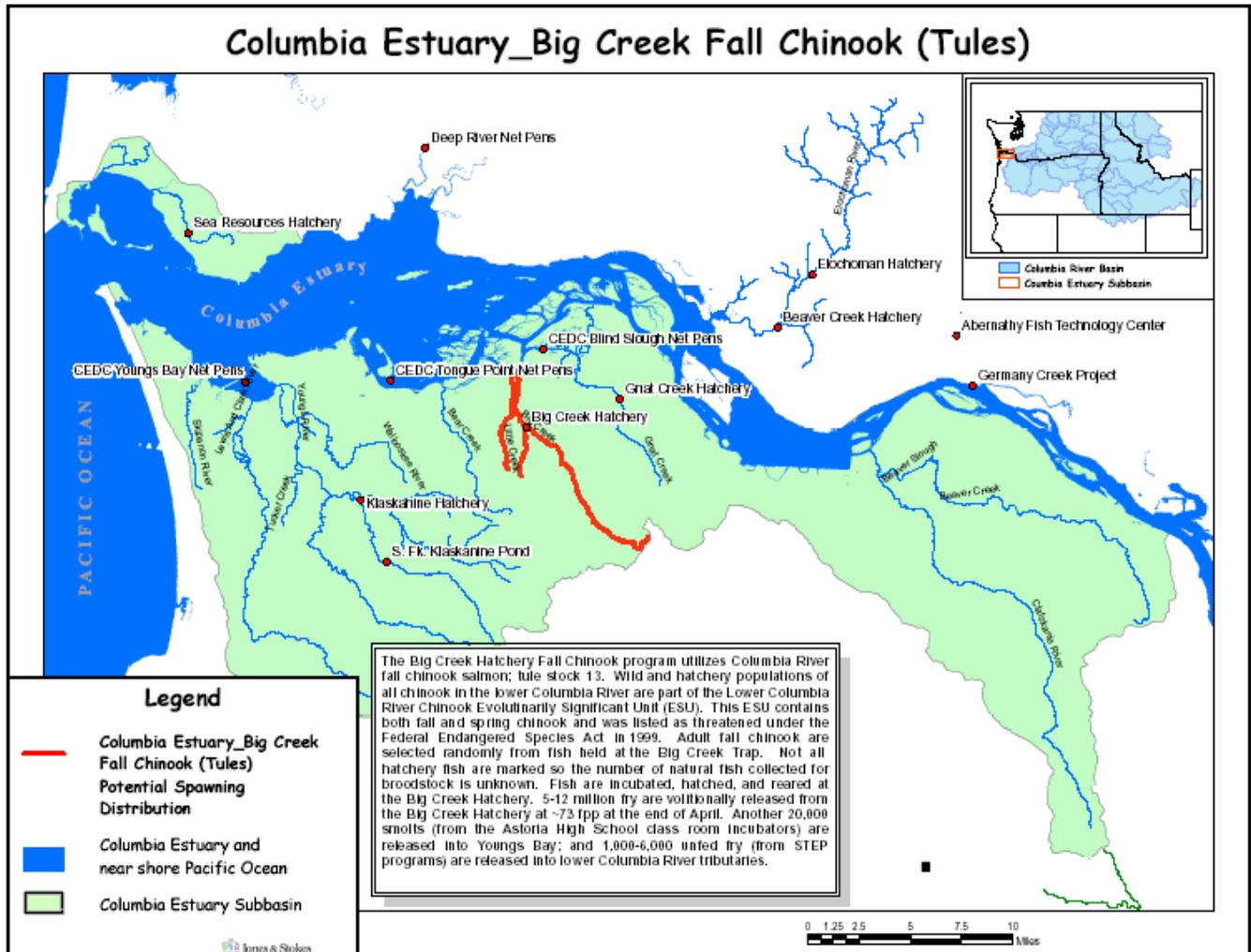
Appendix E

Population Reports

Hatchery Scientific Review Group Review and Recommendations

Columbia Estuary-Big Creek Fall Chinook (Tule-Natural) Population and Related Hatchery Programs

January 31, 2009



1 Columbia Estuary-Big Creek Fall Chinook (Tule)

Fall-run Chinook are native to the basin, with suitable habitat available for several hundred natural spawners. There is some natural spawning below the hatchery weir in Big Creek; it is thought that the majority of these fish are hatchery-origin (NOAA Salmon and Steelhead Hatchery Assessment Group 2003).

2 Current Conditions

2.1 Current Population Status and Goals

Adult escapement to Big Creek is relatively good, although redd counts indicate that there is little natural reproduction in the basin, and the majority of the fish return to the hatchery. The hatchery weir limits natural production to the less productive lower reaches of the creek (W/LCRTRT Status Evaluation 2004).

- ESA Status: This population is listed as threatened and is part of the Lower Columbia Chinook ESU.
- Population Description: The Big Creek fall Chinook population is designated as a Stabilizing population (LCSR&SP 2004).
- Current Viability Rating: Unknown, Viability Goal is Low+
- Recovery Goal for Abundance: Unknown.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (from EDT): Productivity 3.0; Capacity 300.
- Populations Affected by this Hatchery Population: Populations that may be incidentally affected by straying Big Creek tule fall Chinook hatchery fish include species using habitat in Big Creek and the Columbia River and estuary downstream of Big Creek.

2.2 Current Hatchery Programs Affecting this Population

The primary goal of the Columbia Estuary Big Creek fall Chinook (tule) hatchery program is to supplement harvest in commercial and recreational fisheries. Broodstock for the Big Creek Hatchery fall Chinook program is collected from adult returns trapped at Big Creek Hatchery. In the past, eggs from other Lower Columbia River tule fall Chinook hatchery broodstocks have been included in the production when adult returns at Big Creek Hatchery were insufficient. Incubation and rearing occurs at Big Creek Hatchery. This segregated harvest program releases approximately 5.4 million sub-yearling smolts annually into Big Creek. Currently, there are no available estimates of the stray rate for this program.

- The estimated productivity (with harvest) is about 5.2 R/S.
- Adults currently are not passed above the weir at Big Creek Hatchery.
- Average harvest contribution is approximately 7,500 adults.
- Currently, the majority of the production from this program is released with no external mark (i.e., fin clip). Starting with brood year 2006, production will be 100% mass-marked (adipose clip).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – 996 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.1. Average abundance of natural-origin spawners (NOS) would decrease from approximately 76 fish to approximately 11 fish. Harvest contribution of the natural and hatchery populations would go from approximately 7,500 fish to approximately 20 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Consistent with the designation of a Stabilizing population, there are no conservation objectives for this population. There is a non-selective commercial gill net fishery affecting this population. This population is a large contributor of out-of-basin strays, a situation that needs to be contained by increasing the terminal harvest rate, improving homing to the hatchery, installing weirs in non-target receiving streams, or reducing program size. Opportunities to improve homing appear limited; increasing the rate could be difficult because attraction flows are low at the time these fish return.

By improving homing fidelity, the rate of straying will be reduced. Additionally, increasing the terminal harvest would effectively reduce strays.

Recommendations

The HSRG recommends that managers continue the current Big Creek fall Chinook (tule) segregated harvest hatchery program (approximately 5.4 million smolts). Develop a reliable estimate of the stray rate for this program and implement actions to reduce strays in non-target streams.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

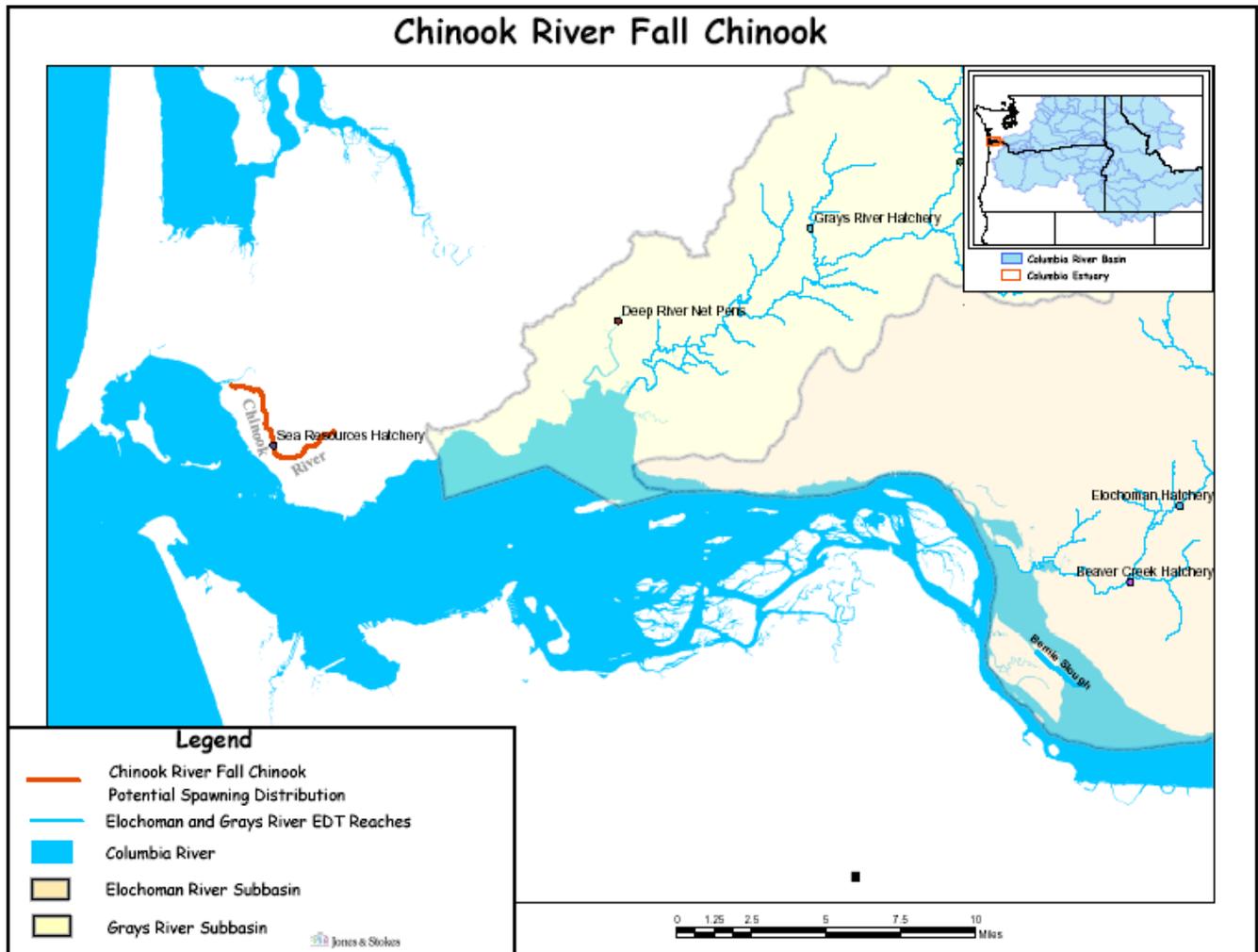
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Big Creek Fall Chinook (Tule Natural). The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|--------------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 75% | 0% | 91% | 0.00 | 76 | 0.6 | 126 | 0 |
| | Seg Harv | 5,826.6 | 75% | | | | | | 7,410 | 1,304 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 11 | 1.1 | 19 | - |
| HSRG Solution | None None | - | 75% | 0% | 74% | 0.00 | 116 | 1.0 | 61 | 0 |
| | Seg Harv | 5,826.6 | 90% | | | | | | 7,302 | 2,054 |
| HSRG Solution w/ Improved Habitat | None None | - | 75% | 0% | 72% | 0.00 | 129 | 1.1 | 67 | 0 |
| | Seg Harv | 5,826.6 | 90% | | | | | | 7,302 | 2,054 |

Hatchery Scientific Review Group Review and Recommendations

Columbia Estuary Fall Chinook (Chinook River-Sea Resources) Population and Related Hatchery Programs

January 31, 2009



1 Columbia Estuary Fall Chinook (Chinook River-Sea Resources)

The Sea Resources Chinook population is believed to be similar to the fall Chinook in the Grays River. No genetic data is available to determine whether the Chinook River stock has diverged from the Grays River tule Chinook. Chinook River fall Chinook are not identified in the WDFW SaSSI 2002 data base. Fall Chinook are native to the Grays River. The natural spawners are now a mixed stock of composite production. Stock mixing very likely began when hatchery supplementation was initiated in 1947 (WDF et al. 1993). The majority of spawning takes place in a 3.6-mile area from the covered bridge on the mainstem (RM 10.7) to the Grays River Salmon Hatchery on the West Fork Grays (RM 1.2). Spawning occurs from late September to mid-November (WDF et al. 1993). In the early 1950s, there was an estimated escapement of 1,000 fall Chinook to the Grays River (WDF 1951). Seining in 1979 captured few naturally-produced, fall Chinook juveniles. This evidence suggests that few natural fall Chinook juveniles were being produced (WDF et al. 1993). Natural spawning escapements from 1967 to 1991 averaged 745 fish, with a low return of 147 in 1967 and a peak of 2,685 in 1978. Grays River Chinook salmon stock status was rated Depressed in 2002, because of a long-term negative trend and a short-term severe decline in escapements in 1997, 1998 and 2000. Generally, lower Columbia tule fall Chinook stocks, including Grays fall Chinook, experienced poor survival in the 1990s.

2 Current Conditions

2.1 Current Population Status and Goals

The fall Chinook program in the Chinook River has been discontinued. It was primarily an education program, and the population has no viability goals. There is no habitat in the Chinook River that appears suitable for Chinook salmon.

- ESA Status: This population is not listed.
- Current Viability Rating: NA
- Recovery Goal for Abundance: NA
- Productivity Improvement Expectation: NA
- Habitat Productivity and Capacity (from EDT): NA
- Populations Affected by this Hatchery Population Include: NA

2.2 Current Hatchery Programs Affecting this Population

The program has been discontinued.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly

greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.4 to 0.8. Average abundance of natural-origin spawners (NOS) would decrease from 29 to 0. Harvest contribution of the natural and hatchery populations would go from 28 to 0.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Recommendations

The HSRG recommends that the educational aspect of the Sea Resources program be continued, with emphasis on monitoring and evaluation for lower Columbia River chum salmon.

The HSRG concluded that there was no reason to consider implementing new fall Chinook programs at this location.

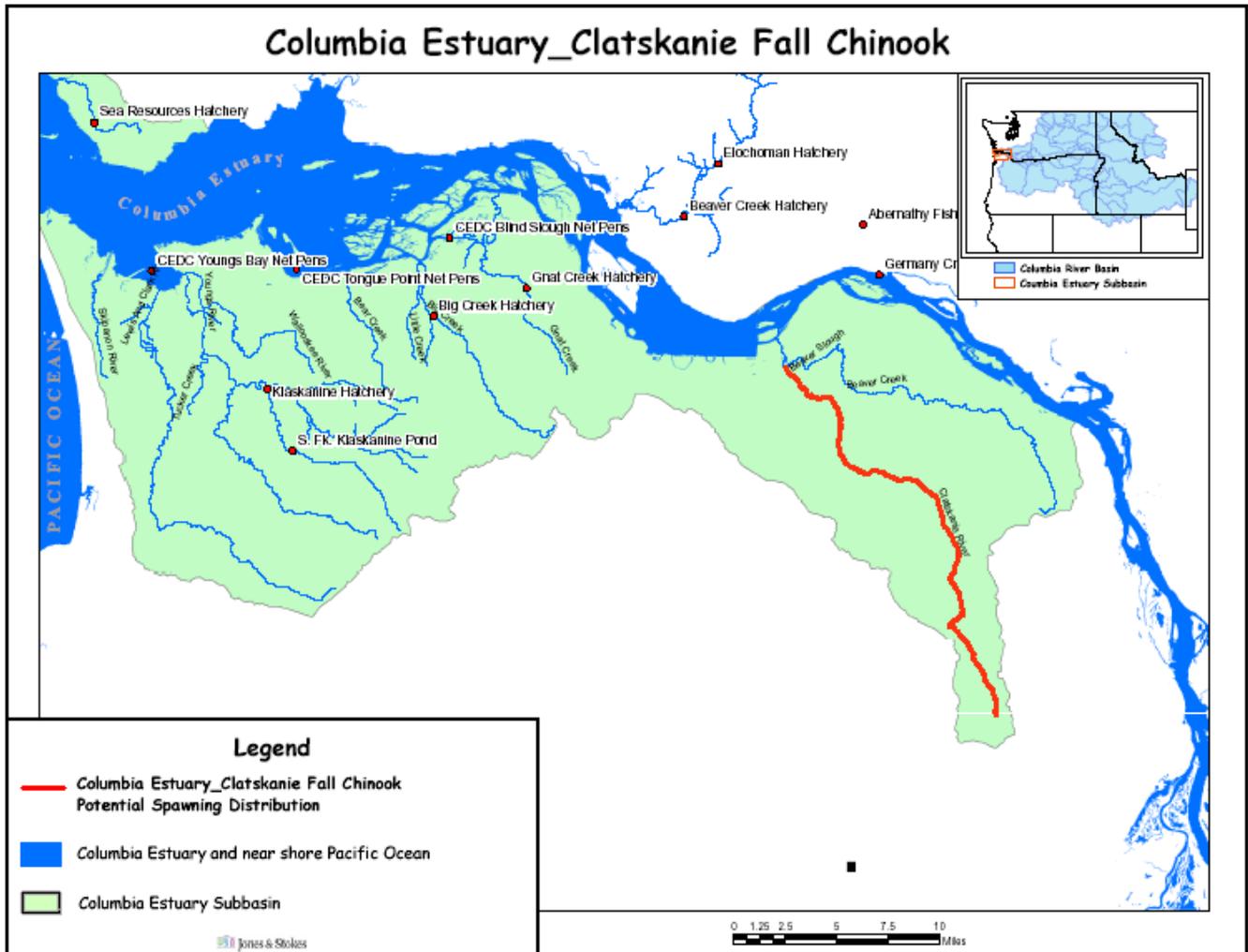
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Columbia Estuary-Chinook River Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 89% | 0.00 | 29 | 0.4 | 28 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 0 | 0.8 | 0 | - |
| HSRG Solution | None None | - | 0% | 0% | 82% | 0.00 | 36 | 0.5 | 16 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 80% | 0.00 | 40 | 0.6 | 18 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Clatskanie Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Clatskanie Fall Chinook

This population is listed as threatened and is part of the Lower Columbia Chinook ESU. The Clatskanie population is one of twenty fall Chinook (tule) populations in the ESU, and is designated as a Primary population (LCSR&SP 2004). Escapement has been consistently low, and redd counts have been critically low, suggesting that few fish successfully reproduce. Little life history information is available about this population, but age structure and run timing are consistent with tule fall-run Chinook. Current habitat quality may not be sufficient to sustain the population (McElhany et al., 2004).

2 Current Conditions

2.1 Current Population Status and Goals

- ESA Status: This population is listed as threatened and is part of the Lower Columbia Chinook ESU.
- Population Description: The Clatskanie population is one of twenty fall Chinook (tule) populations in the ESU, and is designated as a Primary population (LCSR&SP 2004).
- Current Viability Rating: Low, with an objective of a High rating
- Recovery Goal for Abundance: Goal not established.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (from ODF&W): Productivity 44; Capacity 290.
- Populations Affected by this Hatchery Population Include: NA.

2.2 Current Hatchery Programs Affecting this Population

No Chinook hatchery program currently operates in the Clatskanie River; however, about 41 adult Chinook from other programs are estimated to stray into this system annually. Under the current scenario, pHOS is estimated at 24% even though no hatchery Chinook are released in the basin. Annually, approximately 107 natural-origin adults are estimated to return to Gnat Creek.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 41 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly

greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 11.0 to approximately 21.9. Average abundance of natural-origin spawners (NOS) would increase from approximately 110 fish to approximately 150 fish. Harvest contribution of the natural and hatchery populations would go from approximately 110 fish to approximately 150 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is reported to have high productivity; however, it is a capacity-limited system and therefore is unlikely to meet the standards for a Primary population.

If managed as a Primary population, then hatchery fish should be controlled on the spawning grounds and a conservation hatchery could be considered. This population will not meet the 5% pHOS condition for a Primary population without installation of a weir or instituting a more selective fishery.

Recommendations

The HSRG recommends that this population continue to be managed for natural production as a Stabilizing population. Focus actions on habitat protection and improvement that will improve capacity of the system.

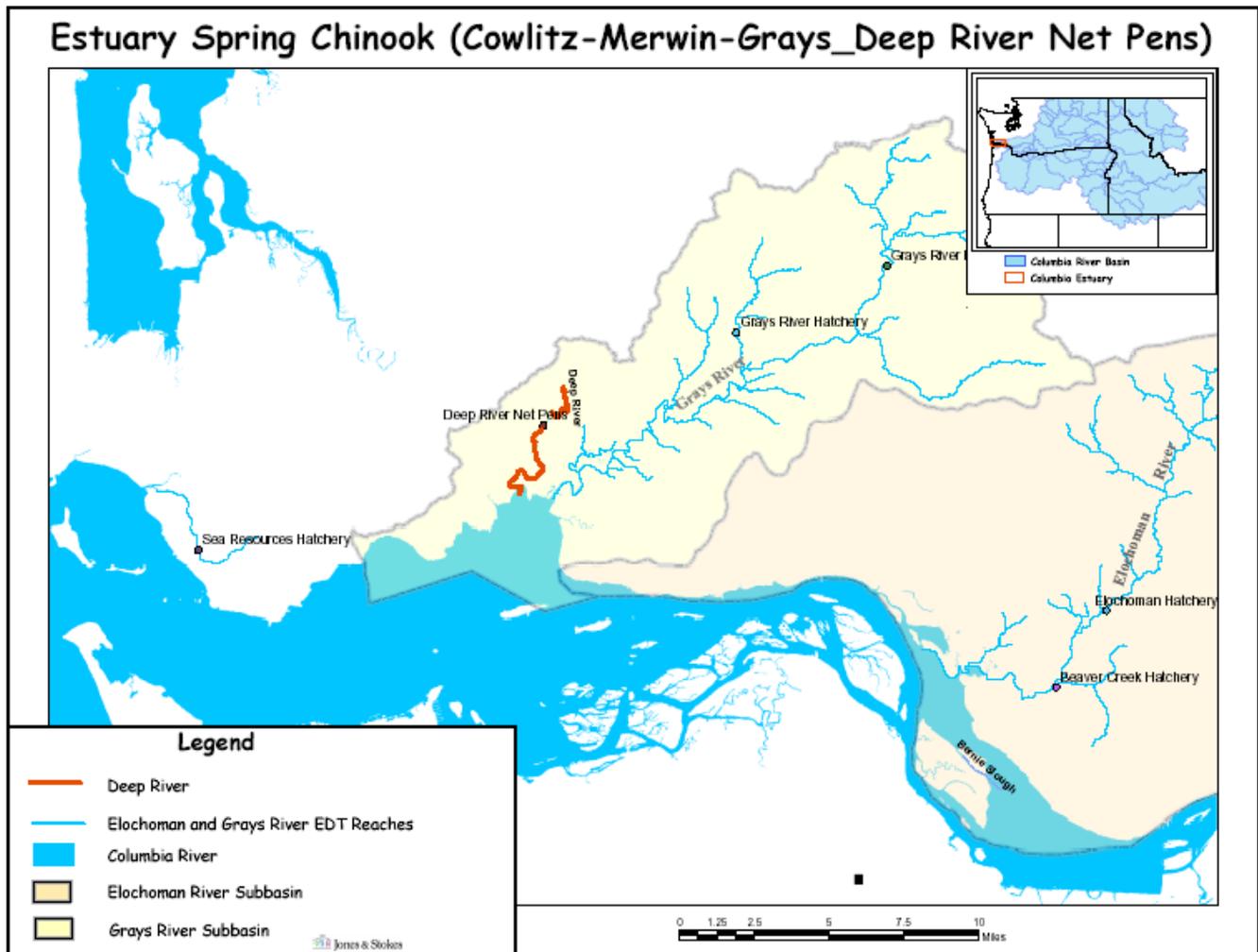
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Clatskanie Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 24% | 0.00 | 107 | 11.0 | 107 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 154 | 21.9 | 154 | - |
| HSRG Solution | None None | - | 0% | 0% | 8% | 0.00 | 157 | 16.7 | 70 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 8% | 0.00 | 176 | 18.9 | 79 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Columbia Estuary Spring Chinook (Deep River Net Pens) Population and Related Hatchery Programs

January 31, 2009



1 Columbia Estuary Spring Chinook (Deep River Net Pens)

There is no natural population corresponding to the Deep River Net Pens Spring Chinook hatchery population because it was derived from out-of-basin (Lewis/Cowlitz River) stock. Native fall Chinook in Washington tributaries of the lower Columbia River are almost all tule fall Chinook, with the exception of bright stock fall Chinook produced in the Lewis River. Small, scattered, naturally spawning fall Chinook populations are observed in Washington tributaries including Grays and Elochoman Rivers, and Skamokawa Creek (HGMP 2004).

2 Current Conditions

2.1 Current Population Status and Goals

The Columbia Estuary Spring Chinook is a hatchery population that is not included as part of the Lower Columbia River Chinook ESU. This population has no viability or recovery goals.

- ESA Status: This population is not listed.
- Population Description: This program is part of the Select Area Fisheries Evaluation Project begun in 1993 to mitigate lost fishery contribution by creating programs to support the harvest of locally produced stocks in off-channel areas of the Columbia River. Fish originate from Cowlitz and Lewis rivers and are listed as threatened under the ESA. There are no local (Columbia estuary) spring Chinook populations affected by this program, and therefore no recovery goal for estuary spring Chinook.
- Current Viability Rating: NA
- Recovery Goal for Abundance: NA
- Productivity Improvement Expectation: NA
- Habitat Productivity and Capacity (from EDT): NA
- Populations Affected by this Hatchery Population: These fish are likely to contribute to spawning aggregations in the lower Columbia River Gorge, particularly in the vicinity of the hatchery. No information was provided to indicate the scale of this straying.
- Hatchery Populations of the Same Species that Affect this Population (e.g., through straying): No straying information from other hatchery programs was provided during this review.

2.2 Current Hatchery Programs Affecting this Population

Broodstock is collected and spawned, and eggs are eyed at Cowlitz and Lewis river facilities. Each population contributes half the eggs for the program. Egg hatching and rearing until net-pen transfer occurs at the Grays River Hatchery. The broodstock contributing to this program (from the Cowlitz and Lewis rivers) is listed as threatened under the ESA, and both contributing populations are subject, or soon to be subject, to reintroduction efforts in their respective watersheds.

The program is described as a segregated harvest program and releases 360,000 yearlings. Since there are no spring Chinook in the Columbia River estuary and this is described as a segregated program, there is no estimate of habitat productivity and capacity for this population. Fish not harvested from this program are likely to stray and spawn in Lower Columbia tributaries in the vicinity of the net pens. Considering the harvest rates indicated by the managers, it is estimated

that approximately 300 spring Chinook from this program escape fisheries to spawn naturally. Approximately 19% of recoveries from this program were at WDFW and ODFW hatcheries, but the contribution to natural spawning appears to be unknown. The projected average harvest contribution from the current program is 2,300 fish annually.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: NA

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Harvest contribution of the natural and hatchery populations would go from 2,374 to 0.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Broodstock used for this program are from programs used for reintroduction in the Cowlitz and Lewis rivers.

Recommendations

The HSRG recommends that the current program be continued. This program could be increased with minimal biological risks, and the infrastructure is in place. Use of this broodstock should not be at the expense of Cowlitz and Lewis river spring Chinook reintroduction needs.

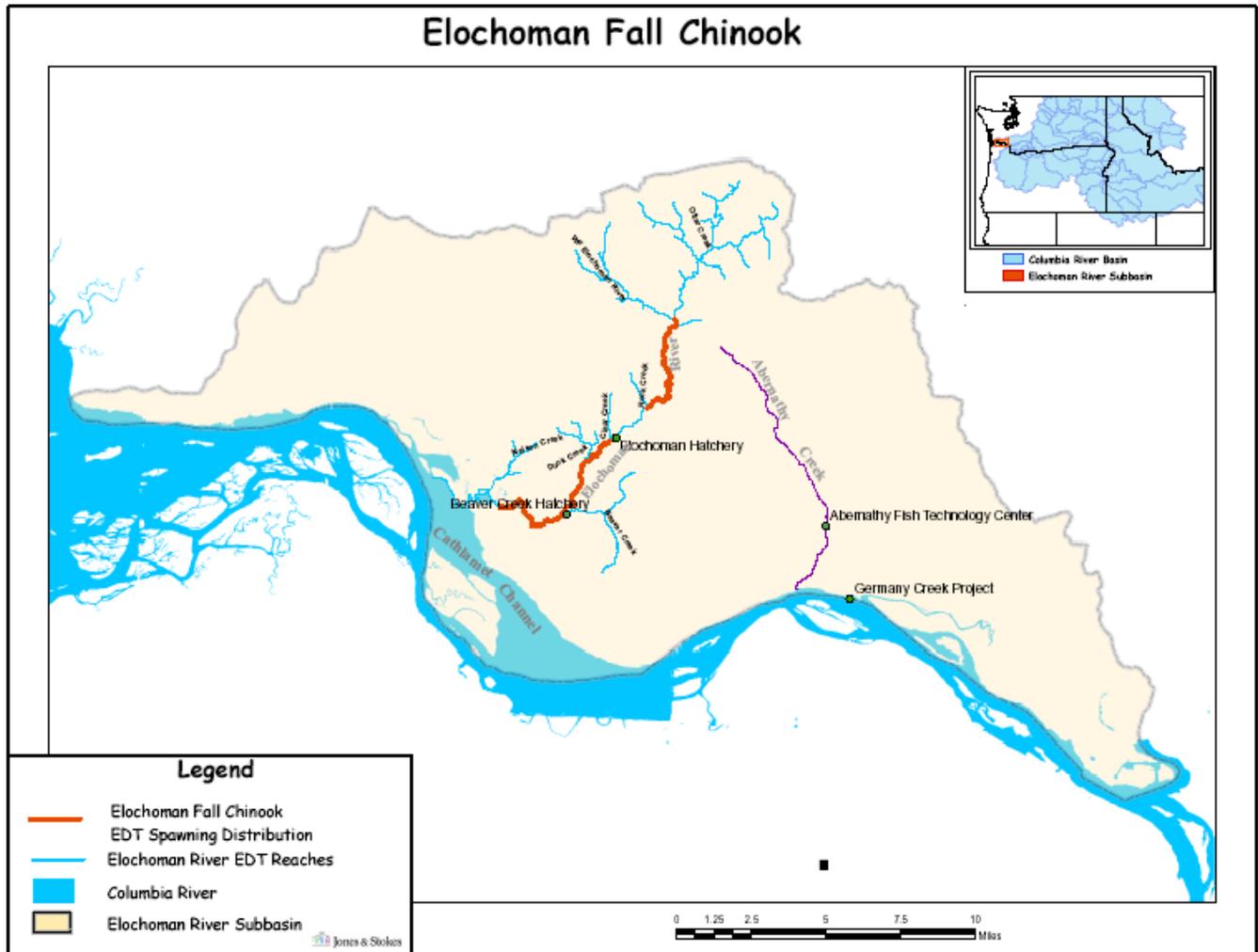
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Columbia Estuary Deep River Net Pen Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 362.3 | 0% | | | | | | 2,374 | 1 |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 362.3 | 0% | | | | | | 2,374 | 1 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 362.3 | 0% | | | | | | 2,374 | 1 |

Hatchery Scientific Review Group Review and Recommendations

Elochoman Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Elochoman Fall Chinook

WDFW has submitted natural and hatchery management draft guidelines (Fall 2003) for Elochoman fall Chinook that will be used in the interim until the TRT recommendations are developed. In 1950, estimated annual escapement of fall Chinook in the Elochoman River was 2,000 fish (WDF 1951). A weir just above tidewater is used to collect fall Chinook for the hatchery. When the hatchery has reached its egg-take goal, the remaining fish are allowed to proceed into the watershed and spawn naturally. On favorable flows, they could go as high as the dam at the hatchery at RM 9.2 and fall Chinook can spawn naturally from RM 3 to RM 11.3. Access above the Elochoman Hatchery is limited by the intake weir. Entry of adults into the subbasin occurs from early September to November. Natural escapement estimates for the Elochoman River have averaged 636 fish during 1987 through 2000. Spawning occurs from late September to mid-November with a peak usually in mid-October. The portion of naturally produced fish in the broodstock program is unknown.

2 Current Conditions

2.1 Current Population Status and Goals

- **ESA Status:** This population is listed as threatened and is part of the Lower Columbia Chinook ESU.
- **Population Description:** There are two populations in the coastal portion of the ESU, Grays River and Elochoman/Skamokawa. Both are designated as Primary populations (LCSR&SP 2004). The Elochoman River likely contained the most significant historical coastal fall Chinook population, but has a history of hatchery transfers from other lower Columbia basin streams.
- **Current Viability Rating:** Low+, with a goal of High. The goal of High was established to address ESU and coast strata risks in meeting tule fall Chinook recovery criteria.
- **Recovery Goal for Abundance:** 1,400 naturally spawning fish.
- **Productivity Improvement Expectation:** The recovery plan (LCSR&SP 2004) provides an expectation of an approximately 10% improvement in productivity and capacity for this stock.
- **Habitat Productivity and Capacity (from EDT):** Productivity 3.03; Capacity 1,706.

2.2 Current Hatchery Programs Affecting this Population

The program currently releases approximately 2,000,000 fingerlings on-station into the Elochoman River. Broodstock for this program was introduced from the Spring Creek National Fish Hatchery and has been maintained using numerous stocks. The stock is considered to be highly mixed due to these transfers. Broodstock is captured at a weir in the lower Elochoman River and is thought to contain some natural-origin fish. The percent of natural-origin fish is uncertain, since the lack of marking in the past has not allowed identification of natural-origin adults, although it is estimated at 6%. Incubation and rearing occur on-station at the Elochoman Hatchery. A mass marking (adipose fin clip) program was started with release year 2006.

The program is described as an integrated harvest program that includes natural-origin fish as broodstock, estimated to comprise 6% of the hatchery spawning population. The current estimate of the proportion of hatchery-origin spawners (pHOS) in the total spawning population is 65%, resulting in a low proportionate natural influence (PNI) of 0.08. The estimated adjusted

productivity (with harvest and fitness factor effects) is estimated to be 0.76. The projected average natural-origin escapement is 220 fish annually. The projected annual harvest contribution is 4,600 fish. Hatchery returns are projected to exceed broodstock needs by approximately 2,700 fish annually.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 514 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 232 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.9 to 1.9. Average abundance of natural-origin spawners (NOS) would increase from 380 to 540. Harvest contribution of the natural and hatchery populations would go from 4,749 to 542.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is affected by out-of-basin strays, the most genetically different originating from the Rogue stock (Youngs Bay release). It was observed that the existing weir cannot remove sufficient strays to meet the primary population standards.

A significant management issue for this population is how to separate out-of-basin strays from Elochoman hatchery returns for an integrated broodstock program. One solution is to uniquely tag, but not adipose clip, fish from the Elochoman Hatchery so they can be distinguished on return and not subject to selective harvest. The current size of the program is inconsistent with its designation as a Primary population. The HSRG observed the hatchery facility to be in poor condition.

Recommendations

This Primary population is important to the ESU. The HSRG recommends that managers operate the hatchery as a much smaller, integrated, conservation program (190,000 uniquely tagged, but not adipose clipped, for selected harvest) to sustain the population until fitness and natural potential has improved to sustain the population. Rebuild the lower river weir to more effectively remove strays (90% efficiency) and collect broodstock, and update the hatchery facility.

To achieve recovery goals for this Primary population, reduced harvest impacts on natural fish, habitat improvements and changes in the current hatchery operations are necessary. The HSRG recommends that every possible step be taken to achieve the abundance goal for this population.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

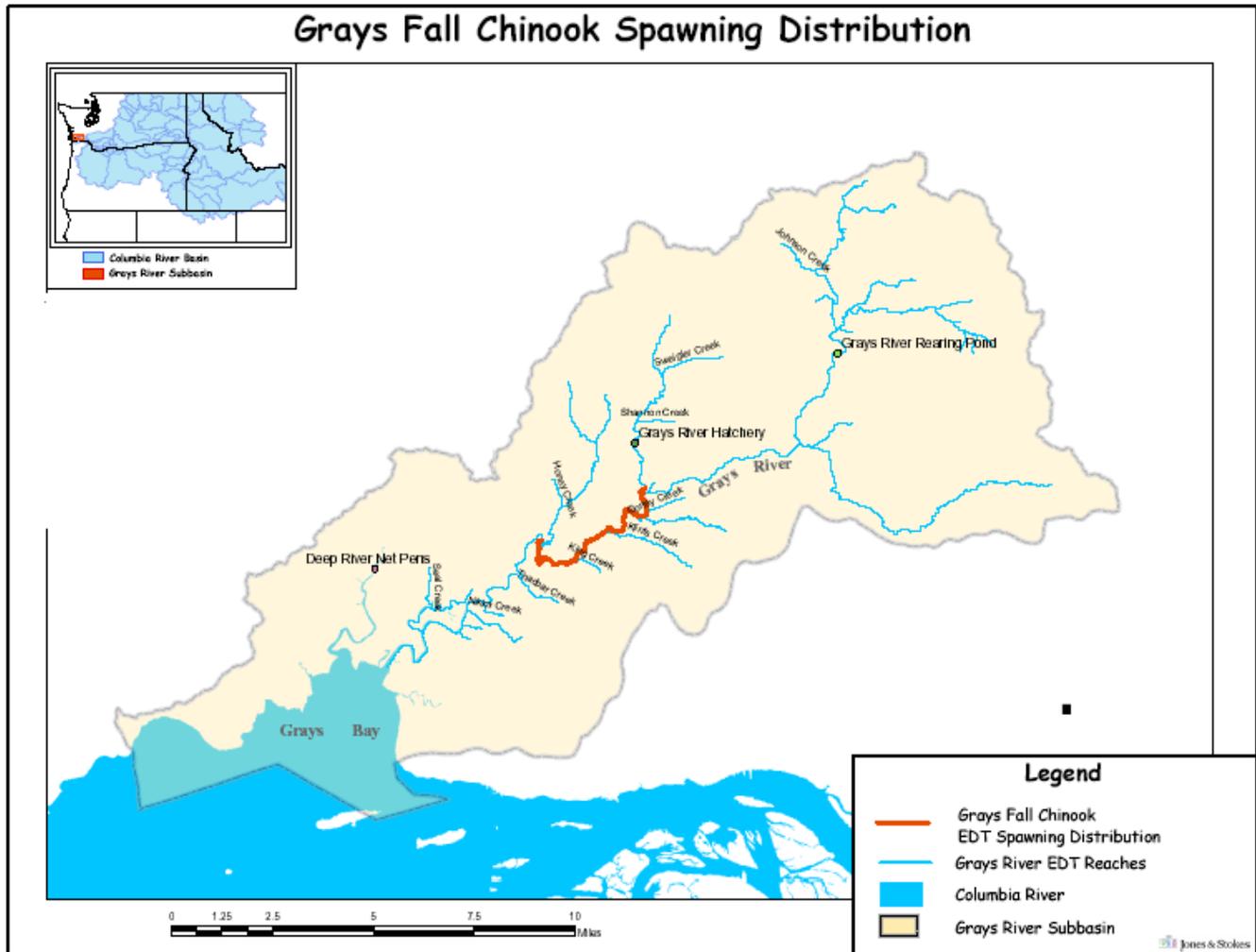
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Elochoman Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Harv | 2,072.1 | 88% | 0% | 61% | 0.09 | 380 | 0.9 | 4,749 | 2,742 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 540 | 1.9 | 542 | - |
| HSRG Solution | Int Cons | 188.4 | 90% | 95% | 1% | 0.96 | 923 | 2.5 | 701 | 447 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 188.4 | 90% | 95% | 1% | 0.96 | 1,087 | 2.8 | 779 | 447 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Grays Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Grays Fall Chinook

Fall Chinook are native to the Grays River. This is now a mixed stock with wild production. A native population of fall Chinook existed in the Grays River prior to the construction of Grays River Hatchery in 1960. Until recently, significant portions of the fall Chinook spawners in the Grays River were hatchery strays. The fall Chinook program at the Grays River Hatchery ended in 1998. The present population is probably a mix of native and hatchery-origin fish with life history characteristics common to those of other lower Columbia River tule fall Chinook stock (SaSSI 2002). Stock mixing very likely began when hatchery supplementation was initiated in 1947 (WDF et al. 1993). The majority of spawning takes place in a 3.6-mile area from the covered bridge on the mainstem (RM 10.7) to the Grays River Salmon Hatchery on the West Fork Grays (RM 1.2). Spawning occurs from late September to mid-November (WDF et al. 1993). In the early 1950s, there was an estimated escapement of 1,000 fall Chinook to the Grays River (WDF 1951). Seining in 1979 captured few naturally-produced, fall Chinook juveniles. This evidence suggests that few natural fall Chinook juveniles were being produced (WDF et al. 1993). Natural spawning escapements from 1967 to 1991 averaged 745 fish, with a low return of 147 in 1967 and a peak of 2,685 in 1978. Grays River Chinook salmon stock status was rated Depressed in 2002 because of a long-term negative trend and a short-term severe decline in escapements in 1997, 1998 and 2000. Generally, lower Columbia tule fall Chinook stocks, including Grays fall Chinook, experienced poor survival in the 1990s.

2 Current Conditions

2.1 Current Population Status and Goals

- **ESA Status:** This population is listed as threatened and is part of the Lower Columbia Chinook ESU.
- **Population Description:** Two populations in the coast portion of the ESU, the Grays River and Elochoman/Skamokawa populations, have been designated as Primary populations with high viability goals (LCSR&SP 2004). The historical Grays River population was likely average in abundance for coastal tule fall Chinook populations. There was a hatchery fall Chinook program in the basin for almost 40 years, but it was recently eliminated. Current returns of naturally produced Chinook are among the lowest in the ESU.
- **Current Viability Rating:** Low+, with a goal of High.
- **Recovery Goal for Abundance:** 1,400.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity:** Productivity 3.0; Capacity 300. The HSRG assigned a default value for an estimate of the current habitat for the Grays fall Chinook, since no other estimate of productivity and capacity were available.
- **Populations Affected by this Hatchery Population Include:** None.

2.2 Current Hatchery Programs Affecting this Population

Currently, there is no hatchery program for Grays fall Chinook. The No Hatchery scenario describes the current condition. The PNI for the population is 1.00 and the pHOS is zero (assuming there is no straying from other programs). Based on the productivity and capacity assumption above, the projected average natural-origin escapement is approximately 50 fish annually. The average harvest contribution is estimated to be approximately 50 fish annually.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 124 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.9 to 1.8. Average abundance of natural-origin spawners (NOS) would increase from 116 to 164. Harvest contribution of the natural and hatchery populations would go from 117 to 164.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is a Primary population that is not meeting recovery standards. Low productivity and low abundance present challenges to sustaining this population. Hatchery strays are occupying available spawning grounds; however, they could be precluded by constructing a lower river weir.

Recommendations

This Primary population is important to the ESU. The HSRG recommends a small, integrated, conservation program at the Grays River hatchery (94,000 uniquely tagged, but not adipose clipped, to avoid selective harvest) to sustain the population until natural productivity and abundance has improved to sustain the population. Install a lower river weir to effectively remove strays and collect broodstock, and update and protect the hatchery water supply.

To achieve recovery goals for this Primary population, it is necessary to reduce harvest impacts on natural fish and improve habitat. The HSRG recommends that every possible step be taken to achieve the abundance goal for this population.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Grays Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 46% | 0.00 | 116 | 0.9 | 117 | 0 |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 164 | 1.8 | 164 | - |
| | None | | | | | | | | | |
| HSRG Solution | Int Cons | 94.2 | 90% | 95% | 2% | 0.97 | 252 | 2.5 | 244 | 244 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 94.2 | 90% | 95% | 1% | 0.97 | 310 | 2.8 | 270 | 244 |
| | | | | | | | | | | |

1 Mill/Abernathy/Germany Creek Fall Chinook

The Mill Creek, Abernathy Creek and Germany Creek fall Chinook stocks have been combined into a single stock based on the Lower Columbia Technical Recovery Team's conclusion that the individual watersheds were too small to support viable Chinook populations.

Data for Mill Creek are total escapement estimates expanded from annual peak live plus dead spawner counts from the Mill Creek Road Bridge (RM 2.0) downstream to the mouth. Data for Abernathy Creek are total escapement estimates expanded from annual peak live plus dead spawner counts from the U.S Fish and Wildlife Service Abernathy Creek Salmon Culture Technology Center weir (RM 3.0) downstream to the mouth of the creek. Data for Germany Creek are total escapement estimates expanded from annual peak live plus dead spawner counts from RM 3.5 downstream to the mouth of the creek.

Stock status was rated Depressed in 2002, because of chronically low escapements. Generally, tule fall Chinook stocks, such as Mill/Abernathy/Germany Creeks fall Chinook, experienced poor survival in the 1990s. Natural spawning abundance is probably more a reflection of U.S. Fish and Wildlife Service Abernathy Creek Salmon Culture Technology Center and other hatchery stray rates than of natural production. (SaSSI 2002).

2 Current Conditions

2.1 Current Population Status and Goals

- **ESA Status:** This population is listed as threatened and is part of the Lower Columbia Chinook ESU.
- **Population Description:** The population has been designated as a Contributing population (LCSR&SP 2004). The historical significance of this population is uncertain. They were largely represented by strays from Abernathy Hatchery until that program was eliminated. They currently support natural spawning populations, with the largest number in Mill Creek.
- **Current Viability Rating:** Low, with a goal of Medium.
- **Recovery Goal for Abundance:** 1,100.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity:** Productivity 3.0; Capacity 300. The HSRG assigned a default value to estimate the current habitat for the Mill/Abernathy/Germany Creek tule fall Chinook, since no other estimates of productivity and capacity were available.
- **Populations Affected by this Hatchery Population Include:** None.

2.2 Current Hatchery Programs Affecting this Population

Currently there is no hatchery program associated with this population; therefore, the No Hatchery scenario describes the current condition.

- The PNI for the population is 1.00 and the pHOS is 19%:
- The adjusted productivity for the stock (including harvest impacts) is estimated to be 1.52.
- Based on productivity and capacity assumptions above, the projected average natural-origin escapement is approximately 60 fish annually.
- The annual harvest contribution is estimated to be 50 fish.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 64 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 1.1 to 2.2. Average abundance of natural-origin spawners (NOS) would increase from 228 to 565. Harvest contribution of the natural and hatchery populations would go from 219 to 544.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population has been designated a Contributing population managed for natural production. It is questionable if these streams historically supported tule fall Chinook, suggesting a Stabilizing designation is more appropriate. There was a tule fall Chinook program that was terminated in the last decade. There is no terminal fishery in these small creeks; it is all in the lower Columbia. The lower reaches of these creeks contain high quality chum habitat, a species that is native to the creeks.

Recommendations

The HSRG identified this as a candidate to develop a segregated harvest program of 1.0 million fish to replace tule production reduced elsewhere. This is consistent with its designation as a Stabilizing population.

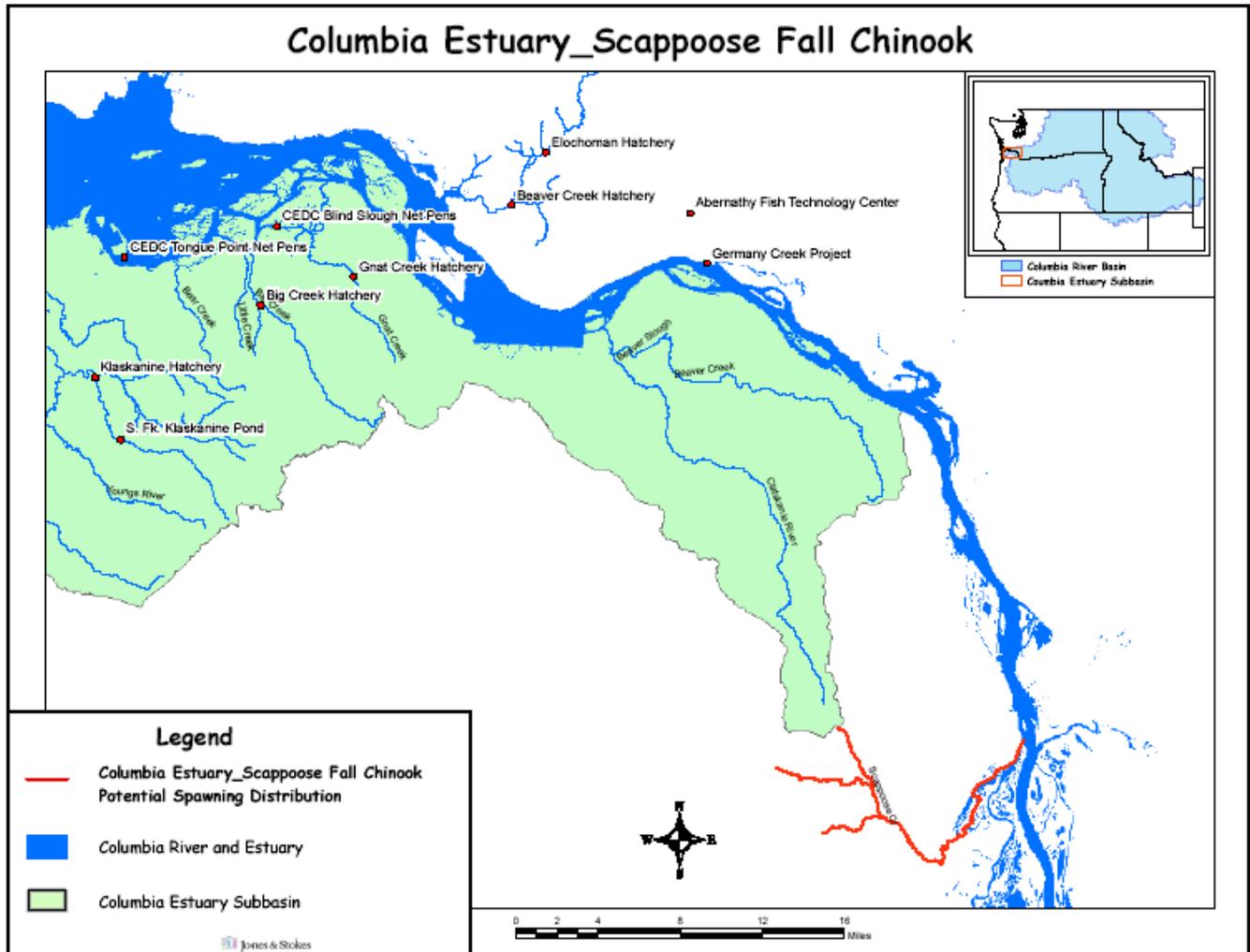
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Columbia Estuary: Mill, Abernathy and Germany Creek Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | | | | | | | | | |
| | None | - | 100% | 0% | 18% | 0.00 | 228 | 1.1 | 219 | 0 |
| No Hatchery | None | | | | | | | | | |
| | None | - | 0% | 0% | 0% | 1.00 | 565 | 2.2 | 544 | - |
| HSRG Solution | None | | | | | | | | | |
| | None | - | 0% | 0% | 66% | 0.00 | 783 | 1.5 | 350 | 0 |
| HSRG Solution w/ Improved Habitat | Seg Harv | 1,023.8 | 75% | 0% | | | | | 7,079 | 5,571 |
| | None | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None | | | | | | | | | |
| | None | - | 75% | 0% | 64% | 0.00 | 868 | 1.7 | 388 | 0 |
| HSRG Solution w/ Improved Habitat | Seg Harv | 1,023.8 | 75% | 0% | | | | | 7,079 | 5,571 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Scappoose Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Scappoose Fall Chinook

This population is listed as threatened and is part of the Lower Columbia Chinook ESU. The Scappoose population is one of twenty fall Chinook (tule) populations in the ESU, and is designated as a Stabilizing population (LCSR&SP 2004). There is little information available about this population aside from anecdotal reports of Chinook being present. Distribution is probably limited by poor habitat conditions, particularly in lower stream reaches (McElhany et al., 2004).

2 Current Conditions

2.1 Current Population Status and Goals

- **ESA Status:** This population is listed as threatened and is part of the Lower Columbia Fall Chinook ESU.
- **Population Description:** The Scappoose population is one of twenty fall Chinook (tule) populations in the ESU, and is designated as a Stabilizing population (LCSR&SP 2004).
- **Current Viability Rating:** Low, with no goal for improvement.
- **Recovery Goal for Abundance:** None established.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity (from EDT):** The current habitat in Scappoose Creek is estimated to have a productivity of 3.0 recruits/spawner and a capacity of 300 fish. This estimate, however, is a default value used in this review alone.
- **Populations Affected by this Hatchery Population Include:** None.

2.2 Current Hatchery Programs Affecting this Population

No Chinook hatchery program currently operates in Scappoose Creek; however, about 41 adult Chinook from other programs are estimated to stray into this system annually. Under the current scenario, pHOS is estimated at 46% even though no hatchery Chinook are released in the basin. Annually, approximately 39 natural-origin adults are estimated to return to Gnat Creek.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 41 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.7 to 1.5. Average abundance of natural-origin spawners (NOS) would increase from approximately 40 fish to approximately 50 fish. Harvest contribution of the natural and hatchery populations would go from approximately 40 fish to 50 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

There is no hatchery on this system, but it receives strays from nearby hatchery programs.

Recommendations

The HSRG recommends that this population continue to be managed for natural production as a Stabilizing population. Focus actions on habitat protection and improvement that will improve productivity and capacity of the system.

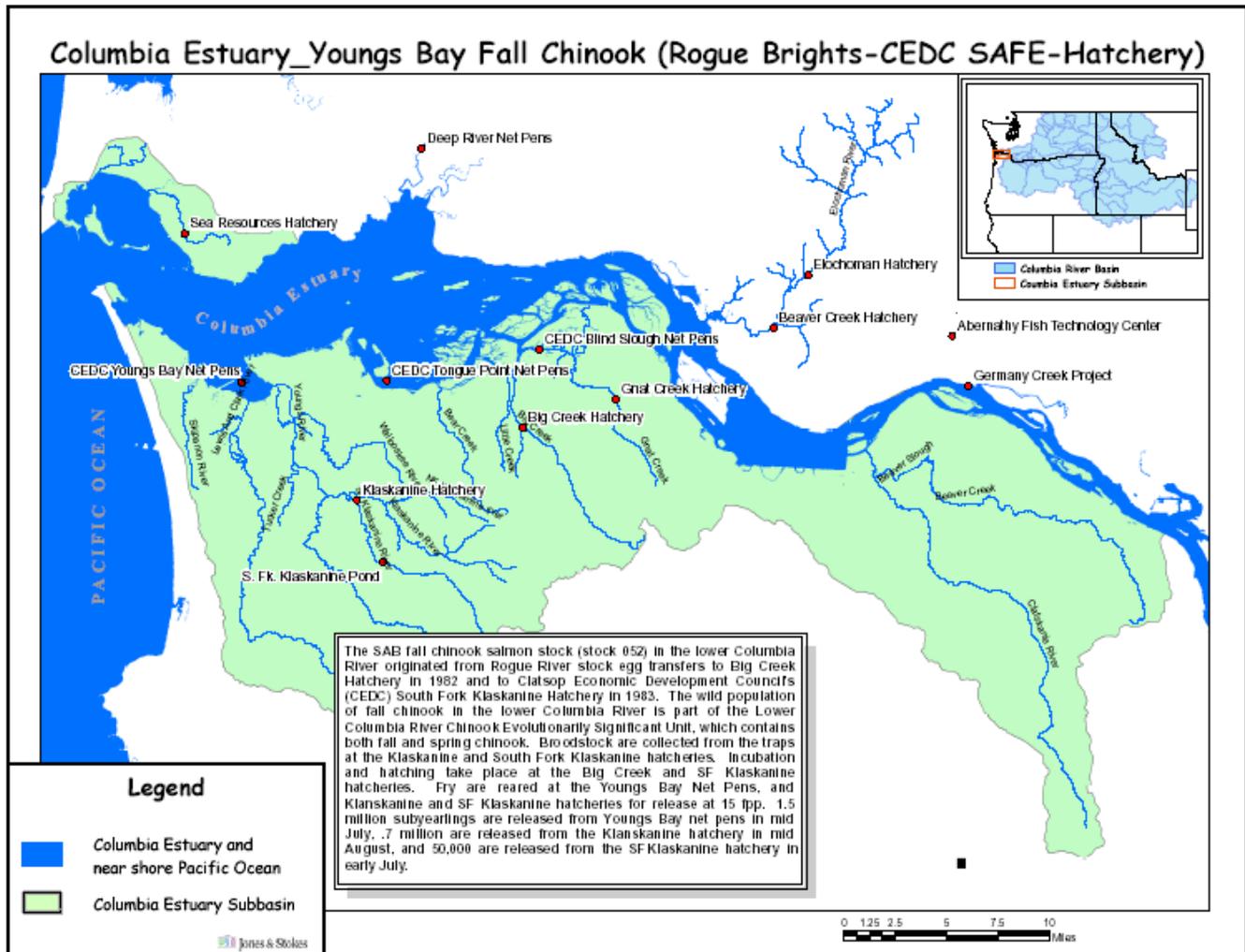
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Scappoose Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 46% | 0.00 | 39 | 0.7 | 39 | 0 |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 52 | 1.5 | 52 | - |
| | None | | | | | | | | | |
| HSRG Solution | None | - | 0% | 0% | 23% | 0.00 | 47 | 1.0 | 21 | 0 |
| | None | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None | - | 0% | 0% | 20% | 0.00 | 58 | 1.2 | 26 | 0 |
| | None | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Columbia Estuary-Youngs Bay Fall Chinook (Rogue Brights-CEDC SAFE-Hatchery) Population and Hatchery Programs

January 31, 2009



1 Columbia Estuary-Youngs Bay Fall Chinook (Rogue Brights-CEDC SAFE-Hatchery)

There is no natural population corresponding to the CEDC- Select Area Bright fall Chinook hatchery population, because it was derived from out-of-basin (Rogue River) stock. Native fall Chinook in Oregon tributaries of the lower Columbia River are almost all tule fall Chinook, with the exception of bright stock fall Chinook produced in the Sandy River. Small, scattered, naturally spawning fall Chinook populations are observed in small Oregon tributaries, with the largest numbers in Big Creek and Plympton Creek, where a significant portion of the natural spawning is comprised of hatchery-produced tule fall Chinook. Small numbers of tule fall Chinook spawn in Youngs Bay tributaries in some years (HGMP 2005).

2 Current Conditions

2.1 Current Population Status and Goals

The Columbia Estuary Fall Chinook (CEDC- Select Area Brights) program is a segregated harvest program to provide harvest of high-quality hatchery-produced salmon released from and returning to select areas (mainly Youngs Bay) with minimal interception of other non-select area stocks.

- ESA Status: This hatchery population is not listed.
- Population Description: The hatchery population was derived from out-of-ESU Rogue River stock and is not part of an ESU. It is located within the geographic boundaries of the threatened lower Columbia River Chinook ESU.
- Current Viability Rating: None
- Recovery Goal for Abundance: None
- Productivity Improvement Expectation: None
- Habitat Productivity and Capacity: NA
- Populations Affected by this Hatchery Population Include: Fall Chinook utilizing North and South Forks of the Klaskanine River, Youngs River, Lewis and Clark River, Youngs Bay, and the Columbia River and estuary downstream of Youngs Bay.

2.2 Current Hatchery Programs Affecting this Population

The Select Area Brights fall Chinook program originated from Rogue River stock egg transfers to ODFW's Big Creek Hatchery in 1982 and to Clatsop Economic Development Council's (CEDC) facility in 1983. Broodstock for this program is collected by several methods, including volitional return of adults to both Klaskanine and South Fork Klaskanine hatcheries and active collection of adults in tidewater sections of Youngs Bay tributaries. Incubation occurs at Big Creek and South Fork Klaskanine hatcheries. Rearing occurs at Big Creek and Klaskanine hatcheries and in the Youngs Bay net pens. Fish are released from Klaskanine and South Fork Klaskanine hatcheries and from Youngs Bay net pens.

- This segregated harvest program annually releases approximately 1.1 million sub-yearling smolts.
- The estimated productivity of the hatchery population is about 10 R/S.
- There is no natural population component, so there is no natural escapement.

- Average harvest contribution is 8,064 adults.
- Hatchery returns slightly exceed broodstock needs.
- The HGMP for this program reports an average stray rate of 1.5% for Klaskanine Hatchery releases. ODFW managers indicated to the HSRG that this value may be a substantial underestimate of the actual stray rate.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Impacts to natural spawning populations will be described in the Youngs Bay tributaries fall Chinook population report. Harvest contribution of the natural and hatchery populations would go from approximately 8,100 fish to zero.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendation box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This large segregated program (1.2 million smolts) makes a significant contribution to harvest, but contributes heavily to out-of-basin straying. The hatchery population was derived from out-of-ESU Rogue River stock and is not part of an ESU. It is located within the geographic boundaries of the threatened lower Columbia River Chinook ESU.

While the HSRG sees little room for improvement in this population, it strongly cautions managers that this program is using out-of-ESU stocks in an area where they do not naturally occur. Switching production from Rogue River Brights to a Columbia River tule stock would be consistent with HSRG principles.

Recommendation

Continue the current 1.2 million Rogue Brights fall Chinook segregated harvest hatchery program. Increase production to 3.3 million with the addition of 2.1 million fish from Washougal tule production. Develop a reliable estimate of the stray rate for this program and a rigorous monitoring program to assess impacts to native stocks.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

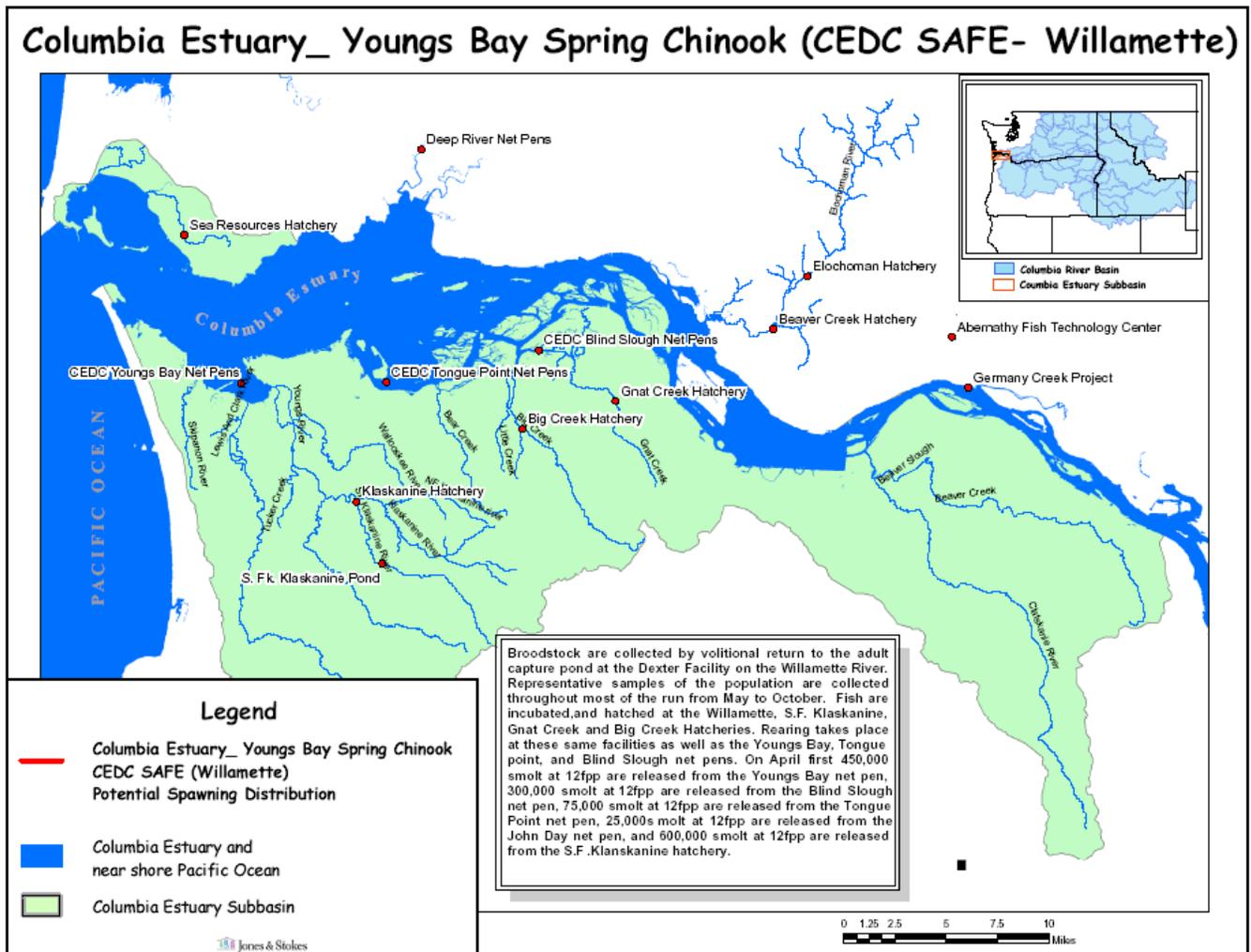
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Youngs Bay Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 1,174.1 | 10% | | | | | | 8,064 | 100 |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 3,342.9 | 10% | | | | | | 25,088 | 71 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 3,342.9 | 10% | | | | | | 25,088 | 71 |

Hatchery Scientific Review Group Review and Recommendations

Youngs Bay Spring Chinook CEDC SAFE Population and Hatchery Program

January 31, 2009



1 Lower Columbia Estuary and Youngs Bay Spring Chinook CEDC SAFE

There is no natural population of spring Chinook in the Columbia Estuary corresponding to this hatchery program. The CEDC Select Area Fishery spring Chinook program utilizes Willamette stock (stock 022 and 024) spring Chinook. The wild population of spring Chinook in the lower Columbia River (LCR) is part of the Lower Columbia River Chinook Evolutionarily Significant Unit (ESU), which contains both fall and spring Chinook. This ESU was listed as threatened under the Endangered Species Act (ESA) in 1999 (Federal Register Notice 1999). These hatchery populations are not considered part of the Lower Columbia River Chinook ESU (Federal Register Notice 2004).

2 Current Conditions

2.1 Current Population Status and Goals

There is no spring Chinook population in this area.

- ESA Status: NA
- Population Description: NA
- Current Viability Rating: NA
- Recovery Goal for Abundance: NA
- Productivity Improvement Expectation: NA
- Habitat Productivity and Capacity (from EDT): NA
- Populations Affected by this Hatchery Population Include: NA

2.2 Current Hatchery Programs Affecting this Population

The Gnat Creek Hatchery Programs are harvest programs used to mitigate the loss of fishing and harvest opportunities resulting from Columbia River Basin hydropower system. For the spring Chinook mid-Willamette stock, eggs received from Willamette Hatchery in October produce 750,000 fingerlings at 25 fish per pound. In early November, 45,000 are transferred to the CEDC Youngs Bay net pens and 300,000 are transferred to the CEDC Blind Slough net pens. All fish are marked (adipose removal) and 25,000 of each group are coded-wire tagged. The remaining 150,000 smolts are reared to a size of 12 fish per pound, then 75,000 are transferred to the CEDC Tongue Point net pens and 75,000 are transferred to the CEDC John Day net pens in mid-March. All fish are marked and 25,000 of each group are coded-wire tagged before transfer. The primary goal of this program is to mitigate for the loss of spring Chinook catch in sport and commercial fisheries in the lower Columbia River select area commercial and sport fisheries.

Estimated number of hatchery strays affecting this population:

- There are no native spring Chinook populations in the region that could be affected by this population (e.g., through straying).

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning

population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Since there is no natural spring Chinook population in the Columbia Estuary, removing hatchery impacts from this program would have no effect on the productivity or natural spawning abundance of any local natural spring Chinook stocks. Harvest contribution of the natural and hatchery populations would go from approximately 4,600 fish to zero.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The program currently releases approximately 750,000 smolts. There are no naturally reproducing spring Chinook populations in the Columbia River estuary.

Recommendations

The HSRG recommends that the current program be continued. This program could be increased with minimal biological risks using existing infrastructure. Capacity may be an issue, since all fish are reared elsewhere.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

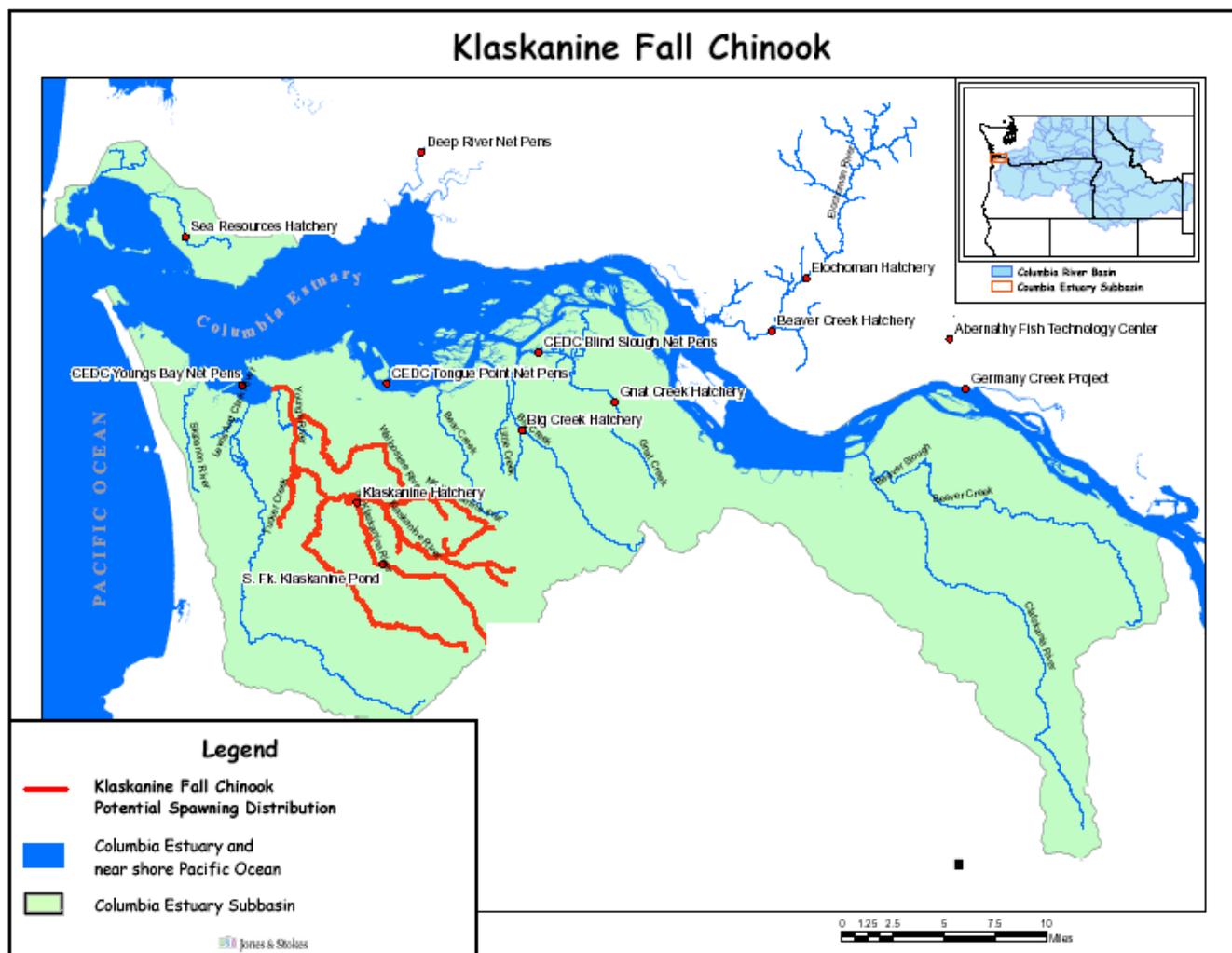
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Columbia Estuary Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 850.1 | 0% | | | | | | 4,594 | 0 |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 850.1 | 90% | | | | | | 4,594 | 385 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 850.1 | 90% | | | | | | 4,594 | 385 |

Hatchery Scientific Review Group Review and Recommendations

Youngs Bay Tributaries Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Youngs Bay Tributaries Fall Chinook

The Youngs Bay watershed is located near the mouth of the Columbia River in the northwest corner of Clatsop County. The Lewis and Clark River, Youngs River, and the Walluski River are the dominant stream systems in the basin. The Youngs River is approximately 17 miles long. The Lewis and Clark River is approximately 21 miles long. Populations of fall Chinook in the lower Columbia River are part of the Lower Columbia River Chinook Evolutionarily Significant Unit (ESU). This ESU contains both fall and spring Chinook, and was listed as threatened under the Federal Endangered Species Act (ESA) in 1999 (Federal Register Notice 1999). This hatchery population is included as part of the Lower Columbia River Chinook ESU (Federal Register Notice 2005). Population abundances are generally low and hatchery fish make up a substantial portion of the escapement. Habitat condition is relatively poor and there is potential for further human population growth and habitat degradation.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: This population is listed as threatened and is part of the Lower Columbia Chinook ESU.
- Population Description: The Youngs Bay fall Chinook population is designated as a Stabilizing population (LCSR&SP 2004).
- Current Viability Rating: Unknown, Viability Goal is Low.
- Recovery Goal for Abundance: Unknown.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (from EDT): Productivity 3.0; Capacity 300.

2.2 Current Hatchery Programs Affecting this Population

No Chinook hatchery program currently operates in Youngs Bay tributaries, but large net pen programs are operated. About 119 adult Chinook from other programs are estimated to stray into this system annually making up approximately 95% of the natural spawning population.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 119 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value

of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.1 to 0.3. Average abundance of natural-origin spawners (NOS) would decrease from approximately 5 fish to 1 fish. Harvest contribution of the natural and hatchery populations would go from 43 fish to 2 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The population has been designated a Stabilizing population. It is unlikely to meet Contributing population standards because fall Chinook habitat is limited.

Recommendations

The HSRG recommends that this population continue to be managed for natural production as a Stabilizing population.

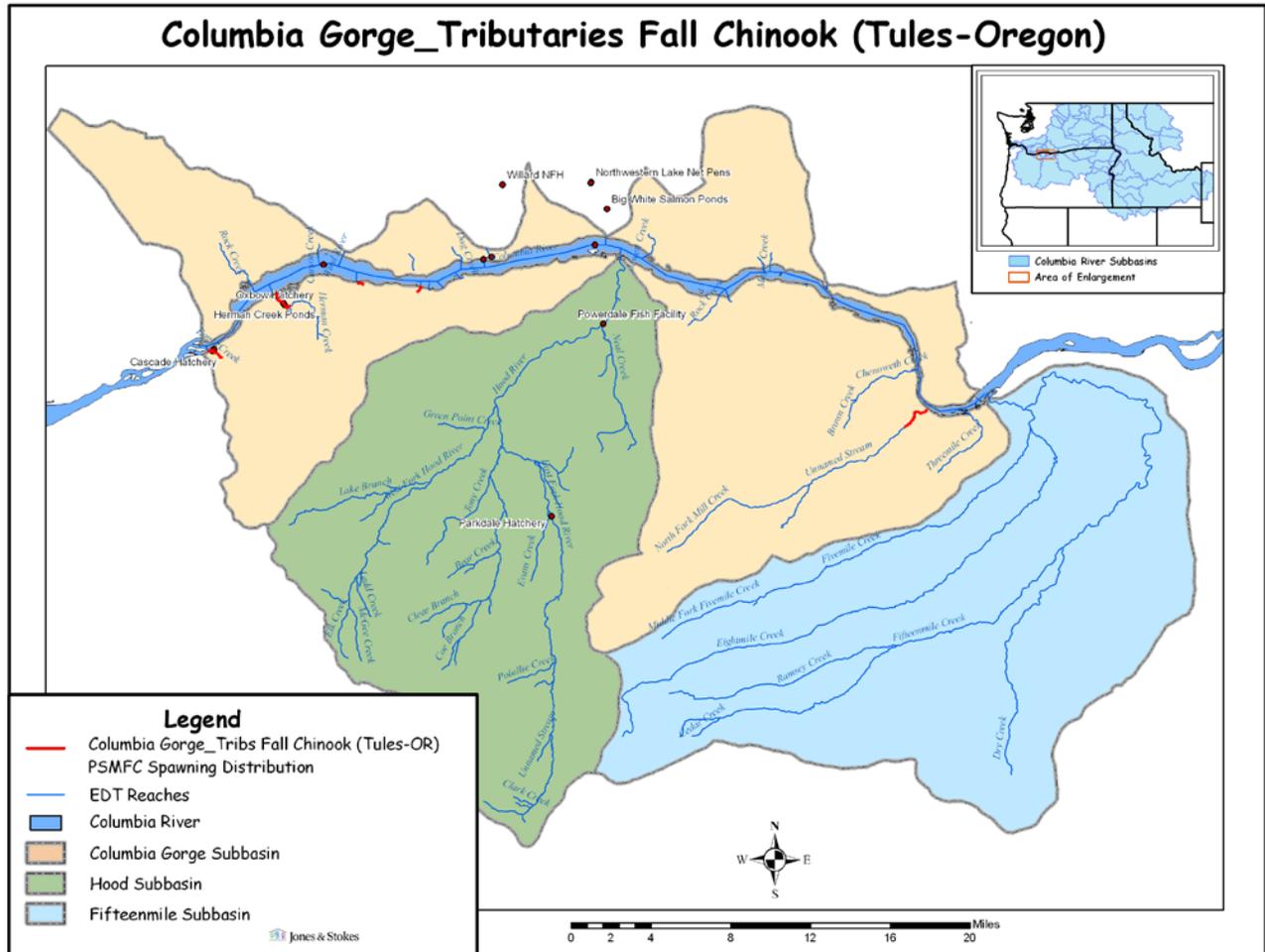
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Youngs Bay Tributaries Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 95% | 0.00 | 5 | 0.1 | 43 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1 | 0.3 | 2 | - |
| HSRG Solution | None None | - | 0% | 0% | 93% | 0.00 | 5 | 0.2 | 31 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 92% | 0.00 | 6 | 0.2 | 35 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Columbia Gorge Tributaries Fall Chinook (Tules-Oregon) Population and Related Hatchery Programs

January 31, 2009



1 Columbia Gorge Tributaries Fall Chinook (Tule-Oregon)

This tule fall Chinook population includes mainstem Columbia River, Herman Creek, Gorton Creek, Viento Creek, Lindsey Creek and Phelps Creek Sub-populations.

Spawning in the Bonneville tributaries occurs from mid-October to late November. Natural spawning of tule fall Chinook occurs primarily in the lower reaches of Herman, Gorton, Viento, Lindsey and Phelps Creeks. Access in the early fall is dependent on mainstem Columbia and tributary flow conditions. Spawning time in the tributaries peaks in October. Smolt or juvenile population and life history data are not available for these streams. Spawning survey data is limited. A total of 892 live and 105 dead adult Chinook salmon were observed in Herman Creek during the 2002 fall surveys conducted by the CRGNSA. During years of good ocean conditions, or even most years, the number of hatchery tule chinook spawning in many of these streams likely exceeds carrying capacity. Superimposition of redds is common.

Fall Chinook in this watershed are greatly influenced by hatchery-origin fish spawning in the wild (Rod French, ODFW, pers. comm.). Fall chinook spawning in watershed streams may be hatchery strays or the progeny of hatchery strays from area fish hatcheries. Genetic analyses are not available to determine which stocks are of natural or hatchery origin.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Fall chinook spawning in the minor tributaries to the Columbia Gorge are part of the Lower Columbia Chinook ESU which was listed as threatened under the ESA in 1999. This decision was reaffirmed in 2005.
- Population Designation: Unknown, but assigned a designation as a Contributing population for the HSRG review.
- Current Viability Rating: Unknown.
- Recovery Goal for Abundance: Unknown.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (from EDT): Productivity 1.5; Capacity 100 (assigned for this review).

2.2 Current Hatchery Programs Affecting this Population

Approximately 34 adult fall Chinook from hatchery programs are estimated to stray into this system annually. Under the current scenario, pHOS is estimated at 83%. Annually, approximately 4 natural-origin adults are estimated to return to the basin.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 34 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.1 to 0.3. Average abundance of natural-origin spawners (NOS) would decrease from approximately 4 fish to 0 fish. Harvest contribution of the natural and hatchery populations would go from approximately 17 fish to 0 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population appears to be supported by the natural spawning of hatchery strays. Hatchery strays are estimated to make up 83% of the natural spawning population. This proportion of hatchery fish on the spawning grounds would only be consistent with designation as a Stabilizing population.

Recommendations

The HSRG recommends that this population be managed for natural production as a Stabilizing population.

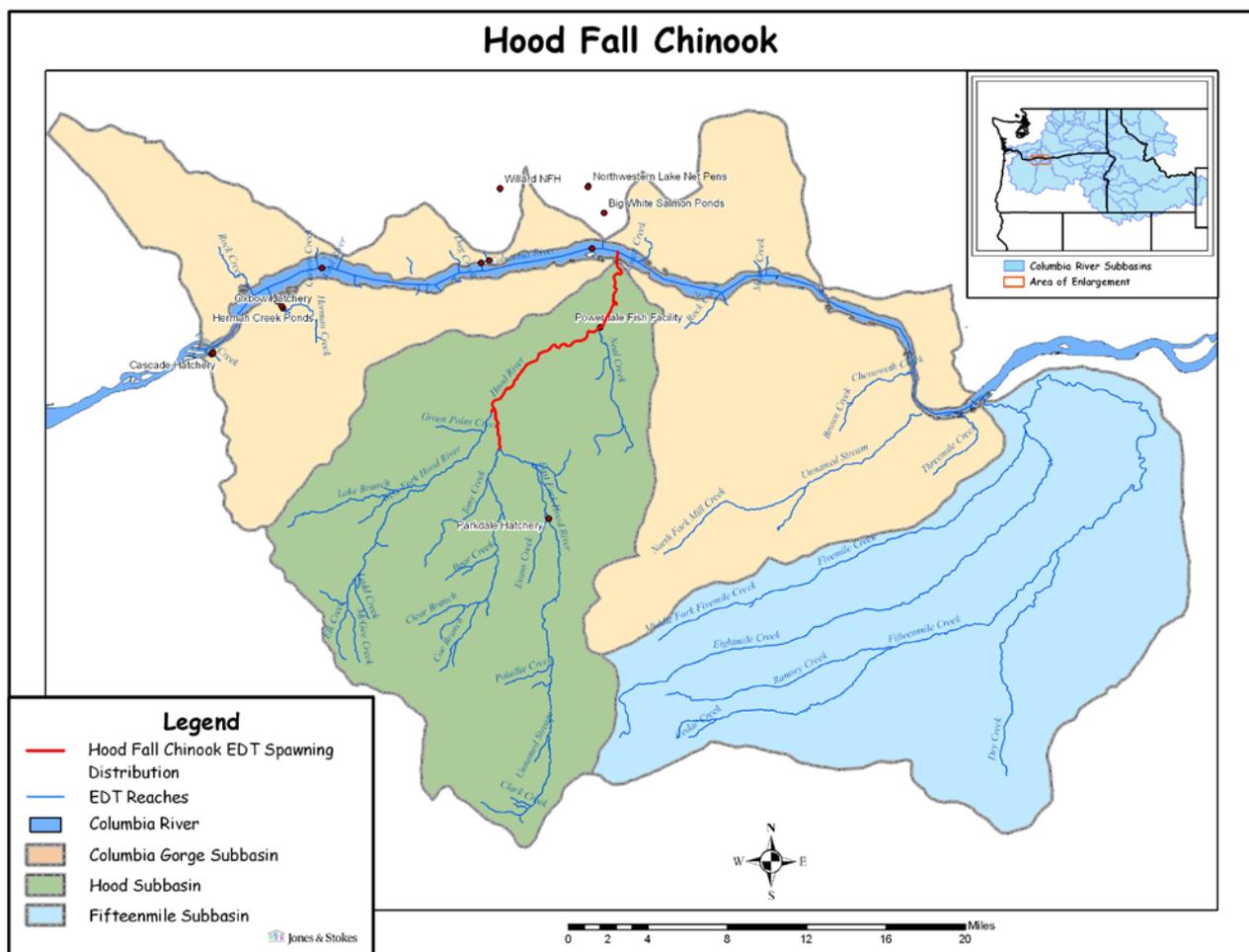
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Columbia Gorge Tributaries Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 83% | 0.00 | 4 | 0.1 | 17 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 0 | 0.3 | 0 | - |
| | | | | | | | | | | |
| HSRG Solution | None None | - | 0% | 0% | 59% | 0.00 | 8 | 0.4 | 7 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 55% | 0.00 | 9 | 0.5 | 8 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Hood River Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Hood River Fall Chinook

Tule fall Chinook are native to the Hood River subbasin, but their abundance has been consistently low in recent years. For the period from 1992-2003, the annual return of fall Chinook to Powerdale Dam has averaged 26 fish, with a range from 6 to 70 (Hood River Subbasin Plan 2004). Between 1992 and 1998, fall Chinook returns to Powerdale Dam ranged from 6 to 36 unmarked fish, with 2 to 7 marked hatchery strays (Olson and French 1999).

The historical fall Chinook run in the Hood River is believed to have always been low, although higher than current levels. Area fish managers believe that egg-to-fry and fry-to-smolt survival is extremely poor for fall Chinook in the Hood River, due in large part to natural factors. Most fall Chinook spawning occurs in the Hood River mainstem, where high glacial sediment loading and a flashy peak flow pattern leads to poor overwinter incubation survival. Shallow stream margin and off-channel habitats important to emergent and early fry survival are scarce in the mainstem Hood River, due natural channel morphology and habitat modification (Hood River Subbasin Plan 2004).

Fall Chinook enter the Hood River from early July through October and spawn in late September through early November. Outmigrant trap data from 1994 to 2001 suggests that wild spring Chinook predominantly migrated out of the Hood River in the fall (Underwood et al. 2003). Ocean-type fall migrants (those that outmigrate in late summer/fall after emergence) are estimated to make up 85% of the population. Stream-type residents and transients (those that either leave the subbasin as yearlings in the second spring after emergence and near their spawning reaches, or rear by redistributing to locations downstream from their spawning reach) make up 15% of the population. The majority of the fall Chinook spawn in the lower Hood River below Powerdale Dam, although spawning also occurs in the lower East Fork and West Fork Hood River and Neal Creek. Fall Chinook spawning occurs in late September through early November (Hood River Subbasin Plan 2004).

Fall Chinook in the Hood River are believed to be hatchery strays and the progeny of hatchery strays. Coincident with a record high run at Bonneville Dam, 109 fall Chinook returned to Powerdale Dam in 2003. The prior record since continuous trapping began in 1992 was 36 (Hood River Subbasin Plan 2004).

NOAA (2005) estimates that 100% of the historical estimated 35 river miles of potential fall Chinook spawning habitat are still intact (Updated Status of West Coast ESUs).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Hood fall Chinook are part of the Lower Columbia Chinook ESU which was listed as threatened under the ESA in 1994.
- **Population Designation:** The Hood fall Chinook population is designated as a Stabilizing population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004).
- **Current Viability Rating:** The LCSR&SP describes current viability as Unknown with a viability goal of Low+.

- Recovery Goal for Abundance: Unknown.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (from EDT): Productivity 1.47; Capacity 4,227.

2.2 Current Hatchery Programs Affecting this Population

No fall Chinook hatchery program currently operates in the Hood River; however, about 188 adult fall Chinook from other programs are estimated to stray into this system annually. Under the current scenario, pHOS is estimated at 80%, even though no hatchery fall Chinook are released in the basin. Annually, approximately 30 natural-origin adults are estimated to return to the Hood River.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 188 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.1 to 0.3. Average abundance of natural-origin spawners (NOS) would decrease from approximately 30 fish to approximately 0 fish. Harvest contribution of the natural and hatchery populations would go from approximately 127 fish to approximately 0 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager’s goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observation

The habitat potential for fall Chinook in the Hood River is extremely poor and for that reason this population is not a candidate to contribute to recovery of the ESU.

Recommendations

The HSRG recommends that managers continue to monitor the contribution of hatchery strays in the Hood River.

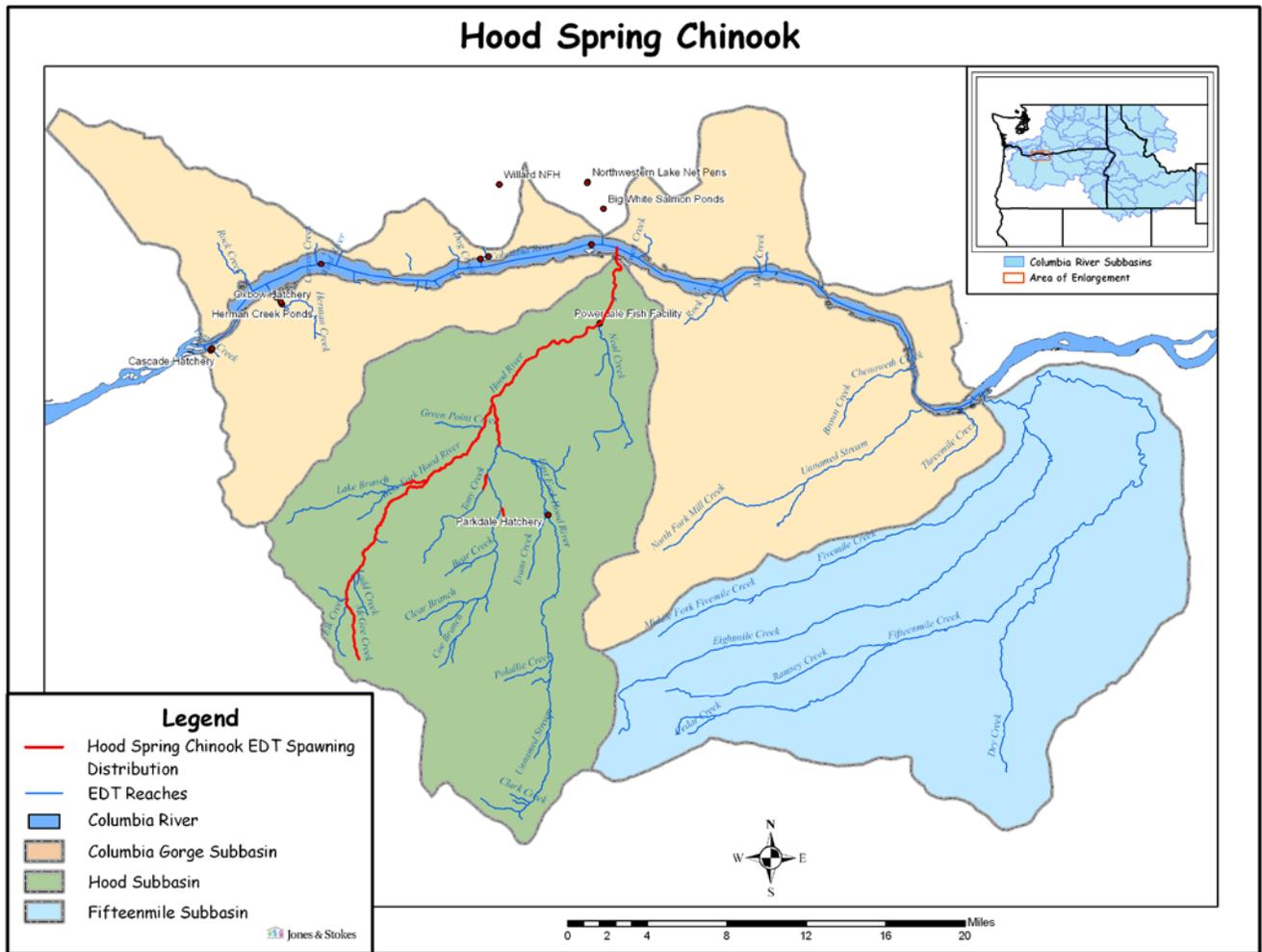
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Hood River Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 80% | 0.00 | 30 | 0.1 | 127 | 0 |
| | None | - | 0% | 0% | 80% | 0.00 | 30 | 0.1 | 127 | 0 |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 0 | 0.3 | 0 | - |
| | None | - | 0% | 0% | 0% | 1.00 | 0 | 0.3 | 0 | - |
| HSRG Solution | None | - | 0% | 0% | 61% | 0.00 | 51 | 0.3 | 67 | 0 |
| | None | - | 0% | 0% | 61% | 0.00 | 51 | 0.3 | 67 | 0 |
| HSRG Solution w/ Improved Habitat | None | - | 0% | 0% | 58% | 0.00 | 59 | 0.4 | 77 | 0 |
| | None | - | 0% | 0% | 58% | 0.00 | 59 | 0.4 | 77 | 0 |

Hatchery Scientific Review Group Review and Recommendations

Hood River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Hood River Spring Chinook

The indigenous Hood River spring Chinook stock was extirpated by the early 1970s (CTWS and ODFW 1991). A population is being reintroduced as part of the HRPP using spring Chinook from the Deschutes River. From 1994 to 2002, the number of returning hatchery spring Chinook increased, while the number of wild (naturally produced) fish decreased, suggesting that the hatchery program was not meeting its supplementation goal (Underwood et al. 2003).

Escapement data from 2002 to 2006 indicates a trend of increasing natural-origin spring Chinook in the Hood River (Olsen 2007). Outmigrant trap data from 1994 to 2001 suggests that a majority of the wild spring Chinook migrate out of the Hood River in the fall (Underwood et al. 2003).

Spring Chinook enter the Hood River from April to September and spawn beginning in mid-August through late September. Spawning occurs throughout the mainstem West Fork and part way up Elk, McGee and Jones creeks and the lower mile of Lake Branch (Hood River Subbasin Plan 2004).

Recruits per spawner (R/S) estimates for spring Chinook were less than 1.0 from 1993-1995, due to poor egg-to-smolt survival. Hood River egg-to-smolt survival was very low, averaging 0.55% compared to an average egg-to-smolt survival of 8.71% in the Warm Springs River (Underwood et al. 2003).

NOAA (2005) estimates that 99% of the historical estimated 150 river miles of potential spring Chinook spawning habitat are still intact (Updated Status of West Coast ESUs).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Hood River spring Chinook are part of the Lower Columbia Chinook ESU which was listed as threatened under the ESA in 1994.
- **Population Designation:** The Hood spring Chinook population is designated as a Primary population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004).
- **Current Viability Rating:** The LCSR&SP describes current viability as Unknown with a viability goal of High.
- **Recovery Goal for Abundance:** Unknown.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity (from EDT):** Productivity: 1.21, Capacity: 1,779.

2.2 Current Hatchery Programs Affecting this Population

An integrated conservation program is currently being operated by ODFW in conjunction with the Confederated Tribes of the Warm Springs. The hatchery program is a conservative approach that has started with a lower hatchery smolt allocation (125,000 smolts). The CTWS has proposed increasing the program size to 150,000 smolts. With the lower hatchery production, risks to listed steelhead should be minimized while HRPP monitors any potential impacts.

Hood River spring Chinook were extirpated in the late 1960s and 1970s following a glacial debris torrent in a tributary of the West Fork Hood River. The Hood River spring Chinook salmon reintroduction program used Carson stock spring Chinook for Hood subbasin releases from 1986 to 1992. Deschutes (Round Butte) spring Chinook have been the designated donor stock since 1993.

The Deschutes stock has two components. The Round Butte Fish Hatchery component was founded from spring Chinook captured in the Pelton Fish Trap located on the Deschutes River at RM 100.0. This hatchery stock has been periodically supplemented with fish or eggs from the Warm Springs National Fish Hatchery stock.

The Warm Springs National Fish Hatchery stock originated from wild spring Chinook arriving at the hatchery diversion dam fish trap on the Warm Spring River (tributary to the Deschutes). The stock has been comprised primarily of hatchery-origin adult spawners, but some wild adults have been periodically included into the hatchery production egg takes.

Hood River broodstock is collected at the Powerdale Fish Facility and is comprised entirely of hatchery-origin adults. Round Butte broodstock is used when Hood River returns do not meet broodstock needs. The total number of spring Chinook collected for broodstock will not exceed 110 fish for the short term. For the long term, the number of brood collected could increase to 150 fish if it is determined that the number of smolts released should be increased to 150,000.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 228 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 24 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.5 to 1.0. Average abundance of natural-origin spawners (NOS) would increase from approximately 195 fish to approximately 2 fish. Harvest contribution of the natural and hatchery populations would go from approximately 253 fish to approximately 0 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The HSRG premise for recommendations is based on the manager's conclusion that the natural Hood River population was extirpated and a decision made to reintroduce spring Chinook using an out-of-ESU hatchery population for rebuilding. It is our understanding that the managers investigated other options, and the Deschutes source was the best choice.

The reintroduction program has a long-term potential to meet the HSRG broodstock management standards for a Primary population designation. However, given current habitat quality, unstable incubation habitat, and limited quantity spawning habitat, the abundance potential is limited.

The managers have taken the important step of discontinuing the practice of importing broodstock from out-of-basin.

The HSRG has general concerns with the practice of transferring fish between basins because of the risk of pathogen transfer (and stress) and straying. The manager's intent to construct additional rearing facilities in the basin could reduce or eliminate this risk.

Removal of the Powerdale Dam in 2010 will result in loss of current hatchery broodstock collection, research studies, and a means of precisely managing spawning composition. Weir sites in the tributaries of the Hood River are being considered, but appear to have lower precision than the Powerdale facility.

Recommendations

Managers should continue to use only Hood River returns for broodstock and eventually convert the program to an integrated program that meets the HSRG broodstock standards for a Primary population. The goal for the program should be to use 100% natural-origin broodstock to the extent possible.

We would recommend developing incubation and rearing facilities in the Hood River for this program. In doing so, managers should apply best hatchery management practices to minimize disease problems.

We support the manager’s intent to install and operate a weir in the West Fork Hood River to achieve both conservation and harvest goals. Scenarios evaluated by the HSRG assumed that the proposed weir in the West Fork Hood River is sufficient to manage the spring Chinook reintroduction, harvest, and conservation.

A fish weir at the Powerdale site would provide a unique opportunity and certainty for meeting research and management goals. Continuing these studies has value in the region, because results would aid in understanding several very important hatchery and natural population management issues.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

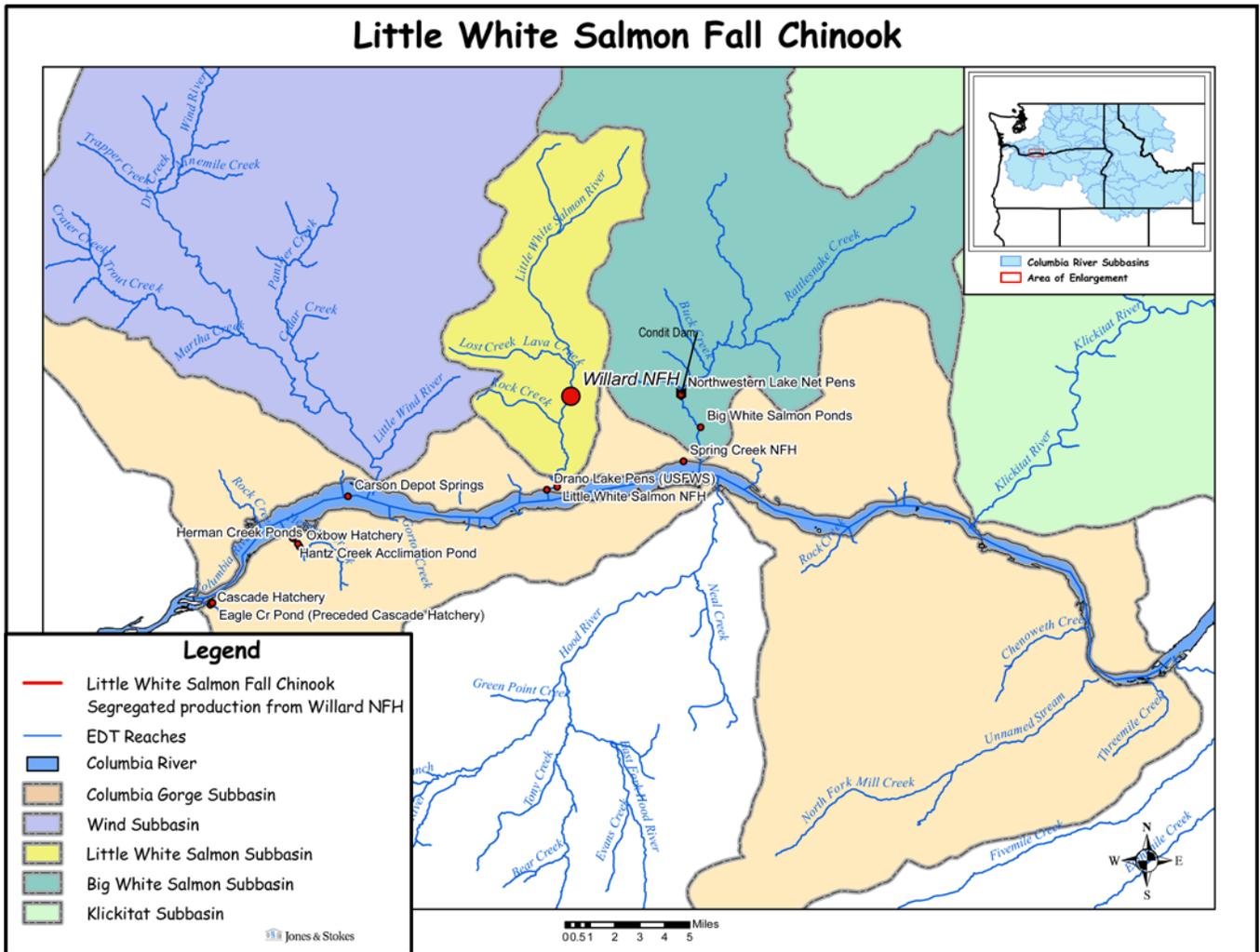
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Hood River Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 125.9 | 50% | 0% | 51% | 0.00 | 195 | 0.5 | 253 | 83 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 2 | 1.0 | 0 | - |
| HSRG Solution | Int Cons | 147.0 | 25% | 0% | 68% | 0.60 | 354 | 0.7 | 471 | 303 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 147.1 | 25% | 0% | 62% | 0.62 | 449 | 0.8 | 484 | 303 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Little White Salmon Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Little White Salmon Fall Chinook

The Little White Salmon fall Chinook are combined with Wind River fall Chinook to form the upper Gorge fall Chinook population. The historical Little White Salmon adult tule fall Chinook population is estimated from 4,000 to 5,000 fish. Current natural spawning returns are 100 to 200 fish. The Little White Salmon Hatchery produces upriver bright (URB) fall Chinook which are not part of the lower Columbia ESU. Fall Chinook spawning occurs in a 0.25-mile stretch of river downstream from the Little White Salmon Hatchery and upstream of Drano Lake. Tule fall Chinook spawning occurs from mid-September to mid-October. The URB fall Chinook spawn from late October through November. Juvenile rearing occurs near and downstream of the spawning areas. Juveniles migrate from the Bonneville tributaries in the spring and early summer of their first year (LCFRB 2004).

Historically, fall Chinook were limited to the lower river below a barrier falls at about RM 2; currently, very limited natural production occurs in this area. Completion of Bonneville Dam (1938) inundated the primary fall Chinook spawning areas in the lower river (LCFRB 2004).

Upstream migration of mid-Columbia bright fall Chinook in the Columbia River occurs from August to October; peak counts at Bonneville Dam occur around September 4-9. Bright fall Chinook spawn at the Little White Salmon National Fish Hatchery in November; natural spawning timing in the Little White Salmon River is late October and November. Ages range from 2-year-old jacks to 5-year-old adults, with dominant adults of ages 3 and 4 (averages are 46.1% and 46.1%, respectively). Emergence and emigration timing of naturally produced fry is unknown. Hatchery fry emerge in March and emigration timing is based on hatchery release timing (LCFRB 2004).

This stock is considered a URB stock in the lower Columbia River ESU. Current bright fall Chinook production is a result of hatchery strays (LCFRB 2004).

Historically, the Little White Salmon fall Chinook population was an earlier spawning tule stock and was substantial, but the population has not persisted. Fall Chinook eggs taken from the Little White Salmon River between 1897 and 1920 (as many as 40 million) indicate a very large historical abundance of naturally produced early spawning tule fall Chinook. In the late 1930s, fall Chinook were reported in the Little White Salmon River during escapement surveys. Fall Chinook returns to the Little White Salmon NFH ranged from 238 to 2,653 from 1979-1983 (averaging 981 fish) (LCFRB 2004).

A smolt capacity model estimated that 73,652 fall Chinook fingerlings could be produced in the Little White Salmon River subbasin. The White Salmon River tule fall Chinook stock is currently produced at Spring Creek NFH (LCFRB 2004).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Little White Salmon River fall Chinook are part of the Lower Columbia Chinook ESU; which was listed as threatened under the ESA in 1999.

- Population Description: The Little White Salmon fall Chinook population is part of the Upper Gorge Tributaries population, which is designated as Stabilizing in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP, 2004). The LCSR&SP describes current viability as Low with a viability goal of Unknown. The extinction risk was estimated as approximately 50% (LCFRB 2004).
- Recovery Goal for Abundance: Unknown.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (e.g., from EDT): Unknown.

2.2 Current Hatchery Programs Affecting this Population

The Little White Salmon (RM 1) and the Willard National Fish Hatcheries (RM 5) are located in the basin; hatchery production began in 1896. Annual hatchery egg take of fall Chinook during 1897-1920 was typically 10-30 million and as high as 40 million. Hatchery production shifted from tules to URB late fall Chinook as part of the John Day Dam mitigation and a US v. Oregon Agreement in 1988. The current Little White Salmon Hatchery fall Chinook program includes 3.7 million URB fall Chinook, with 2 million released into the Little White Salmon River and the remainder transferred to the Yakima River as part of John Day Dam mitigation (LCFRB 2004).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 2,051 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.1 to 0.2. Average abundance of natural-origin spawners (NOS) would increase/decrease from 45 to 0. Harvest contribution of the natural and hatchery populations would go from 6,398 to 0.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This program makes an important contribution to harvest.

The HSRG anticipates that future reliance on imported broodstock from this program would be reduced or eliminated. Eliminating out-of-basin transfers of fish or eggs from this program would do away with the possibility of disease transfers to out-of-basin sites. The water supply at Willard National Fish Hatchery has a rainbow trout population known to be infected with the kidney disease bacterium. Eggs and fish transferred from this hatchery may thus be infected with the bacterium.

Strays from this program to the White Salmon River have been observed. There appears to be a need to improve homing fidelity.

Recommendations

The HSRG recommends continuing this program. In addition, the HSRG supports the USFWS effort to PIT-tag a representative portion of the release for the purpose of developing in-season management information. All fish currently are mass-marked and a portion are coded-wire tagged for monitoring harvest contribution, stray rates and to provide other relevant biological information.

The HSRG recommends that capture efficiency be improved or maintained.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very

least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

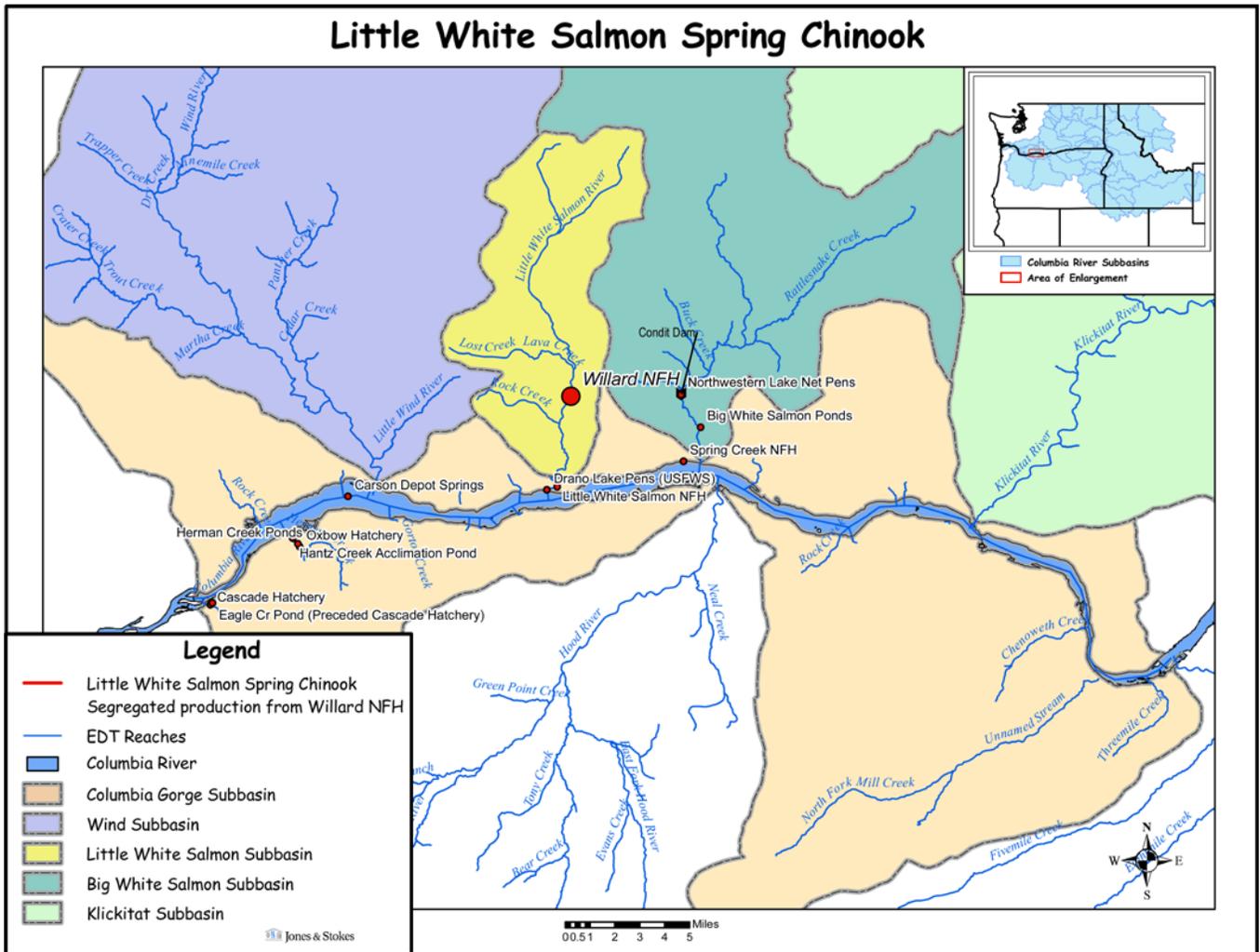
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Little White Salmon Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|---|-------------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 97% | 0.00 | 45 | 0.1 | 268 | 0 |
| | URB - Hatchery Seg Harv | 2,007.2 | 75% | | | | | | 5,865 | 1,497 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 0 | 0.2 | 0 | - |
| HSRG Solution | None None | - | 0% | 0% | 92% | 0.00 | 136 | 0.3 | 176 | 0 |
| | URB - Hatchery Seg Harv | 2,007.2 | 80% | | | | | | 5,321 | 1,085 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 91% | 0.00 | 149 | 0.4 | 194 | 0 |
| | URB Hatchery Seg Harv | 2,007.2 | 80% | | | | | | 5,321 | 466 |

Hatchery Scientific Review Group Review and Recommendations

Little White Salmon Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Little White Salmon Spring Chinook

Little White Salmon spring Chinook is one of four spring Chinook populations in the Columbia River Evolutionarily Significant Unit (ESU). Spring Chinook in the Little White Salmon River subbasin are hatchery fish of mixed origin (LCFRB 2004).

In 1936, Chinook were reported in the Little White Salmon River during escapement surveys, although historically, few spring Chinook were found in the Little White Salmon River Subbasin. Spring Chinook were limited to the lower river below a barrier falls at about RM 2. Completion of Bonneville Dam (1938) inundated the primary spring Chinook spawning areas in the lower river (LCFRB 2004).

Hatchery production accounts for all spring Chinook returning to the Little White Salmon River. From 1970-2002, spring Chinook total returns ranged from 58 in 1974 to 20,601 in 2002. Juvenile production from natural spawning is presumed to be low; the run is not considered to be self-sustaining (LCFRB 2004).

Spring Chinook return to the Little White Salmon River from April through July; spring Chinook counts peak at Bonneville Dam in late April. Natural spawning in the Little White Salmon River is limited to a small area immediately below the salmon hatchery and occurs in July and August. Age ranges from 3-year-old jacks to 6-year-old adults, with 4- and 5-year-olds usually the dominant age class (averages are 72.0% and 21.9%, respectively). No natural fry emergence data are available (LCFRB 2004).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Little White Salmon River spring Chinook are part of the Lower Columbia Chinook ESU, which was listed as Threatened under the ESA in 1999.
- Population Description: The Lower Columbia Salmon Recovery and Subbasin Plan indicates that spring Chinook are not present in the Upper Gorge tributaries, which include the Little White Salmon River (LCSR&SP 2004).
- Recovery Goal for Abundance: Unknown.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (e.g., from EDT): Unknown.

2.2 Current Hatchery Programs Affecting this Population

The Little White Salmon (RM 1) and the Willard National Fish Hatcheries (RM 5) are located in the Subbasin. Spring Chinook releases began here in the 1960s, and current releases into the Little White Salmon River are just over 1 million smolts annually. Hatchery production accounts for all spring Chinook returning to the Little White Salmon with mixed origin broodstock. In addition, broodstock is collected to release 250,000 fish in the Walla Walla River. The Walla

Walla export is temporary; in 2008 this program is expected to move to the Carson National Fish Hatchery.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 382 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Harvest contribution of the natural and hatchery populations would go from 1,651 to 0.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Eliminating out-of-basin transfers of fish or eggs from this program would do away with the possibility of disease transfers to out-of-basin sites. The water supply at Willard National Fish Hatchery has a rainbow trout population known to be infected with kidney disease bacterium. Eggs and fish transferred from this hatchery may thus be infected with the bacterium.

The USFW has credited culling of high-titer BKD egg lots in conjunction with reduced rearing densities as the reason for improved fish quality and health (i.e., reduced BKD problems) in recent years. Culling is generally recognized as an effective technique for controlling BKD prevalence in hatcheries. Less well documented is the effect of using reduced rearing densities to control BKD.

We note that the PIT-tag program apparently is proving to be an important in-season management tool for managing the hatchery and harvest.

Recommendations

The HSRG recommends maintaining the current program. In addition, the HSRG supports the measures implemented to reduce BKD in the hatchery. We recommend, however, that experiments be implemented to evaluate the effectiveness of using reduced rearing densities.

The HSRG supports the USFWS effort to PIT-tag a representative portion of the release for the purpose of developing in-season management information. All fish currently are mass-marked and a portion are coded-wire tagged for monitoring harvest contribution, stray rates and to provide other relevant biological information.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

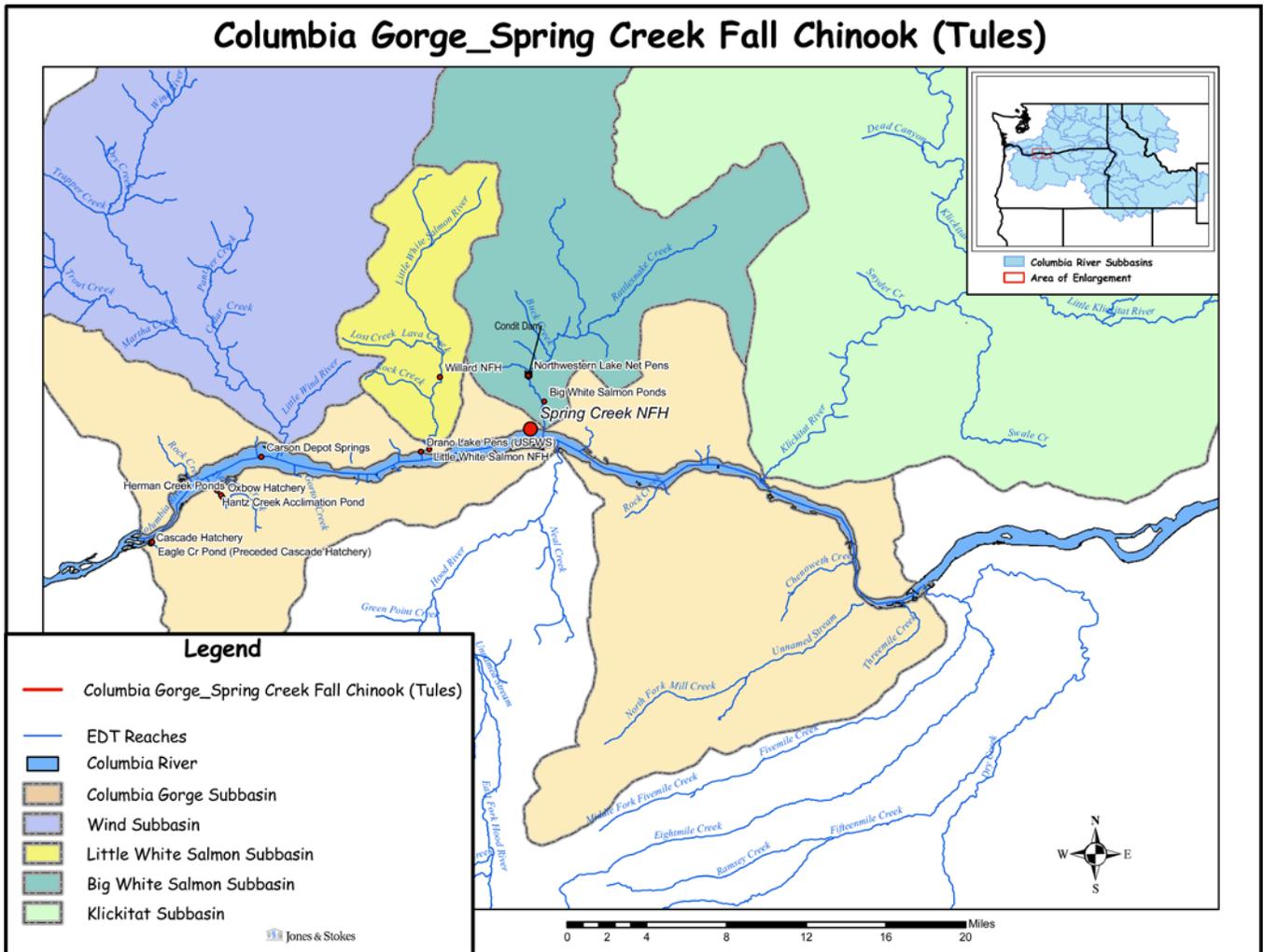
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Little White Salmon Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 1,005.2 | 90% | | | | | | 1,651 | 1,323 |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 1,005.2 | 90% | | | | | | 1,651 | 1,123 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 1,005.2 | 90% | | | | | | 1,651 | 1,123 |

Hatchery Scientific Review Group Review and Recommendations

Columbia Gorge Spring Creek Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Columbia Gorge Spring Creek Fall Chinook

The Spring Creek fall Chinook (tule) is a segregated hatchery population. There is no natural self-sustaining fall Chinook population in Spring Creek.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- **ESA Status:** White Salmon River Spring Chinook are part of the Lower Columbia Chinook ESU, which was listed as threatened under the ESA in 1999. The hatchery component of Columbia River fall Chinook is considered part of the ESU (including those from the Spring Creek Hatchery), but is not essential for recovery.
- **Population Description:** There is no natural population; this is a hatchery population.
- **Recovery Goal for Abundance:** There is no natural population; this is a hatchery population.
- **Productivity Improvement Expectation:** There is no natural population; this is a hatchery population.
- **Habitat Productivity and Capacity (e.g., from EDT):** There is no natural population; this is a hatchery population.

2.2 Current Hatchery Programs Affecting this Population

The purpose of the tule fall Chinook program at Spring Creek National Fish Hatchery is to mitigate for lost and degraded habitat and fish populations caused by the construction and operation of the Columbia River hydropower system by producing locally adapted broodstock for sport, commercial, tribal, and international harvest. The Spring Creek tule fall Chinook broodstock originated from the White Salmon River, a mile from the location of the hatchery, and is the stock of choice for reintroduction in the White Salmon River pending Condit Dam removal. Approximately 15,100,000 fingerling fall Chinook are released on-site annually.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program – from AHA summary: NA.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – from AHA summary: 1,660 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions,

not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Harvest contribution of the natural and hatchery populations would go from 70,994 to 0.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The HSRG noted that all unmarked fish were returned to the river. At the present time, the origin of these unmarked fish is unclear (e.g., truly natural-origin fish or mis-clipped hatchery-origin fish).

The management policy and practice for incorporating jacks in spawning protocols is unclear to the HSRG.

The Spring Creek Hatchery is a 90% water re-use system. This has been identified as a risk factor and is being evaluated by the USFWS.

This program sees very high survival rates relative to other programs in the region and consistently is a major contributor to the tule harvest.

Recommendations

Continue the program as currently operated.

The HSRG supports the USFWS objective to PIT-tag a representative portion of the release for the purpose of developing in-season management information. All fish currently are mass-marked and a portion coded-wire tagged for monitoring harvest contribution, stray rates and to provide other relevant biological information.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

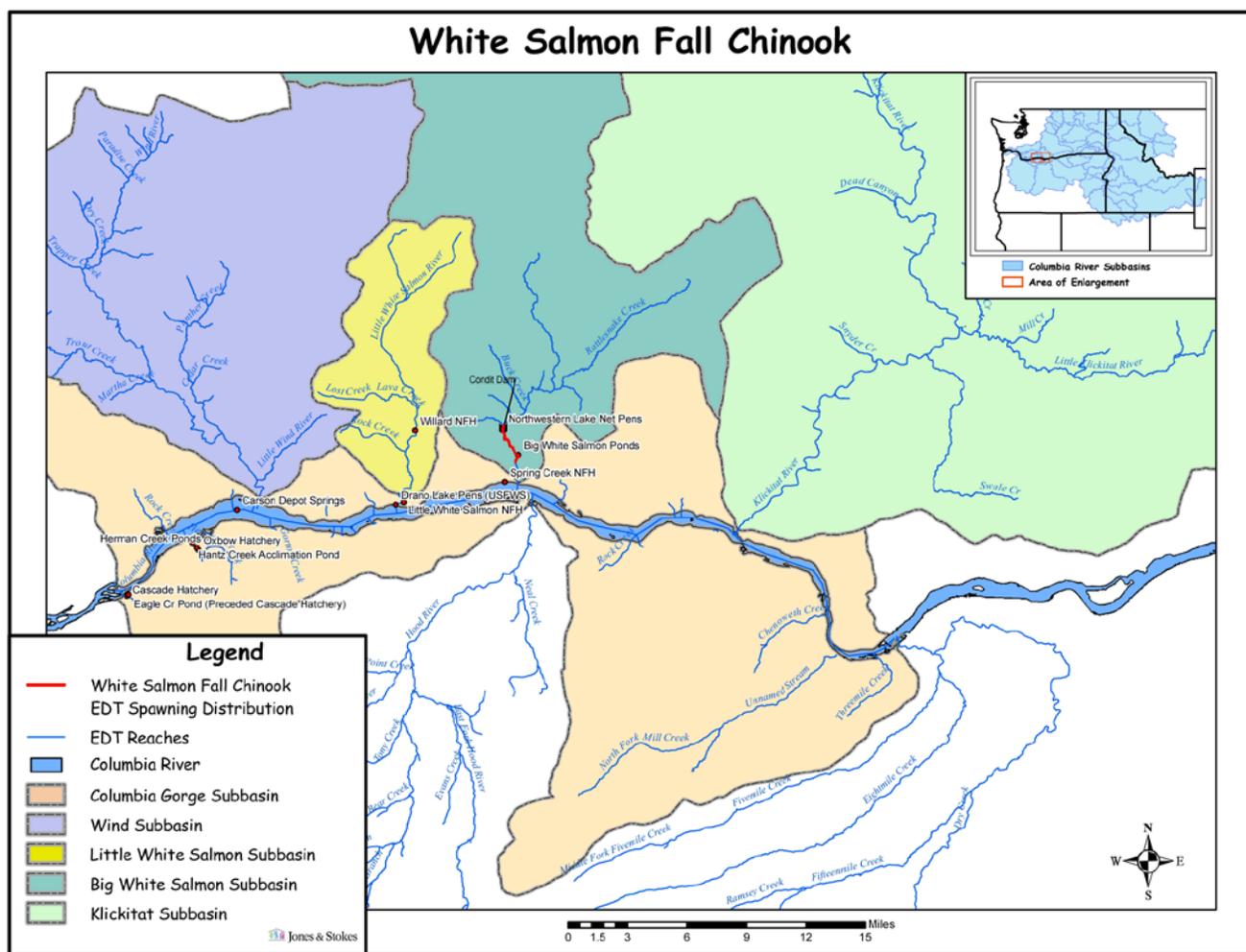
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Columbia Gorge Spring Creek Fall Chinook (Tules – Hatchery). The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 15,044.9 | 90% | | | | | | 70,994 | 5,658 |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 15,044.9 | 90% | | | | | | 59,397 | 15,673 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 15,044.9 | 90% | | | | | | 59,397 | 15,673 |

Hatchery Scientific Review Group Review and Recommendations

White Salmon Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 White Salmon Fall Chinook Salmon

The White Salmon River has both tule and bright natural spawning Chinook. Tules are native to the White Salmon River and listed for protection under ESA. The brights are not native and not listed under the ESA. Historically, the tule fall Chinook population was large in the White Salmon. Spawning is currently confined to the lower 3 miles of mainstem White Salmon River below Condit Dam (RM 3.3).

The tule fall Chinook is a mixed stock with composite production. The White Salmon River tule fall Chinook stock is represented both in wild spawners and in local hatchery programs. Tule fall Chinook were used as broodstock to create the Spring Creek Hatchery tule fall Chinook program in 1901. Strays from Spring Creek NFH have been recovered in the White Salmon River.

The estimated wild escapement of tule fall Chinook from 1992 to 2004 averaged 319 fish, ranging from 32 to 1,696 adults. Based on EDT modeling, the current tule fall Chinook abundance at equilibrium is expected to be 982 adults in the absence of harvest. Although escapement of tule fall Chinook increased in 2001, stock status was rated depressed in 2002, due to chronically low escapements. Loss of historic spawning habitat above Condit Dam may contribute to poor stock performance. Fall Chinook enter the river from August through October and are usually near final stages of maturity upon entry. Tule spawning generally occurs in October, earlier than in the White Salmon River bright fall Chinook. No genetic analysis has been done on White Salmon River tule fall Chinook.

The upriver bright (URB) fall Chinook is a non-native stock with composite production. White Salmon River URB fall Chinook appear to be derived from the Little White Salmon National Fish Hatchery URB fall Chinook. Escapements have been fairly stable and the stock status was rated healthy in 2002. Spawning is confined to the lower 3 miles of the mainstem White Salmon River below Condit Dam. Spawning generally occurs in October, later than the White Salmon River tule fall Chinook stock.

The Spring Creek Hatchery is located immediately downstream of the river mouth and straying of returning hatchery adults to the White Salmon River is consistent. A treaty Indian fishery targets Spring Creek Hatchery fish near the river mouth. The White Salmon population is targeted for medium viability.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: White Salmon River fall Chinook are part of the Lower Columbia Chinook ESU, which was listed as Threatened under the ESA in 1999.
- Population Description: The White Salmon fall Chinook population is designated as a Contributing population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes current viability as Low with a viability goal of Medium.
- Recovery Goal for Abundance: 900.
- Productivity Improvement Expectation: Unknown.

- Habitat Productivity and Capacity (e.g., from EDT): Productivity 6.08; Capacity 1,172 (with Condit Dam in place); according to EDT results, fall Chinook potential is the same or slightly less with removal of Condit Dam.

2.2 Current Hatchery Programs Affecting this Population

No fall Chinook hatchery programs occur within this basin.

The Spring Creek Hatchery program, which originated from White Salmon fall Chinook stock, is located immediately downstream of the river mouth and produces fish that stray into the White Salmon River. Since 1992, Spring Creek Hatchery tules have accounted for more than 30% of the natural spawning fish. The percentage of hatchery fish spawning naturally has ranged from 0% to 86% during this period. Based on allozyme analysis, WDFW identified Spring Creek Hatchery tules as genetically different than all other tule stocks.

There is a segregated harvest program for URB fall Chinook at the Little White Salmon/Willard NFH Complex. The purpose of the program is to provide mitigation (production for fisheries) for the federal hydropower system impacts, other development, to meet obligations under the U.S. v Oregon court agreement, and to produce 1.7 million fry for transfer to the Yakima River Basin. A total of 2 million sub-yearling URB fall Chinook salmon are reared and released on-site from Little White Salmon NFH as part of the Corps of Engineers' John Day Dam mitigation program (HGMP 2004).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 675 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.2. Average abundance of natural-origin spawners (NOS) would decrease from 128 to 38. Harvest contribution of the natural and hatchery populations would go from 533 to 159.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Removal of Condit Dam will open additional habitat for tule fall Chinook. This population receives significant numbers of strays from neighboring hatchery populations, both tules and upriver brights.

The best available broodstock for reintroduction/recovery of the White River tule population is currently being evaluated.

Recommendations

If managers determine there is a need to control the stray fish from nearby hatcheries to achieve a pHOS consistent with a contributing population (less than 0.1), a control weir could be considered in the lower river. Other means, such as selective harvest of hatchery fish in the terminal area, also might be considered.

The HSRG supports the USFWS effort to PIT-tag a representative portion of the release for the purpose of developing in-season management information. All fish currently are mass-marked and a portion is coded-wire tagged for monitoring harvest contribution, stray rates and to provide other relevant biological information.

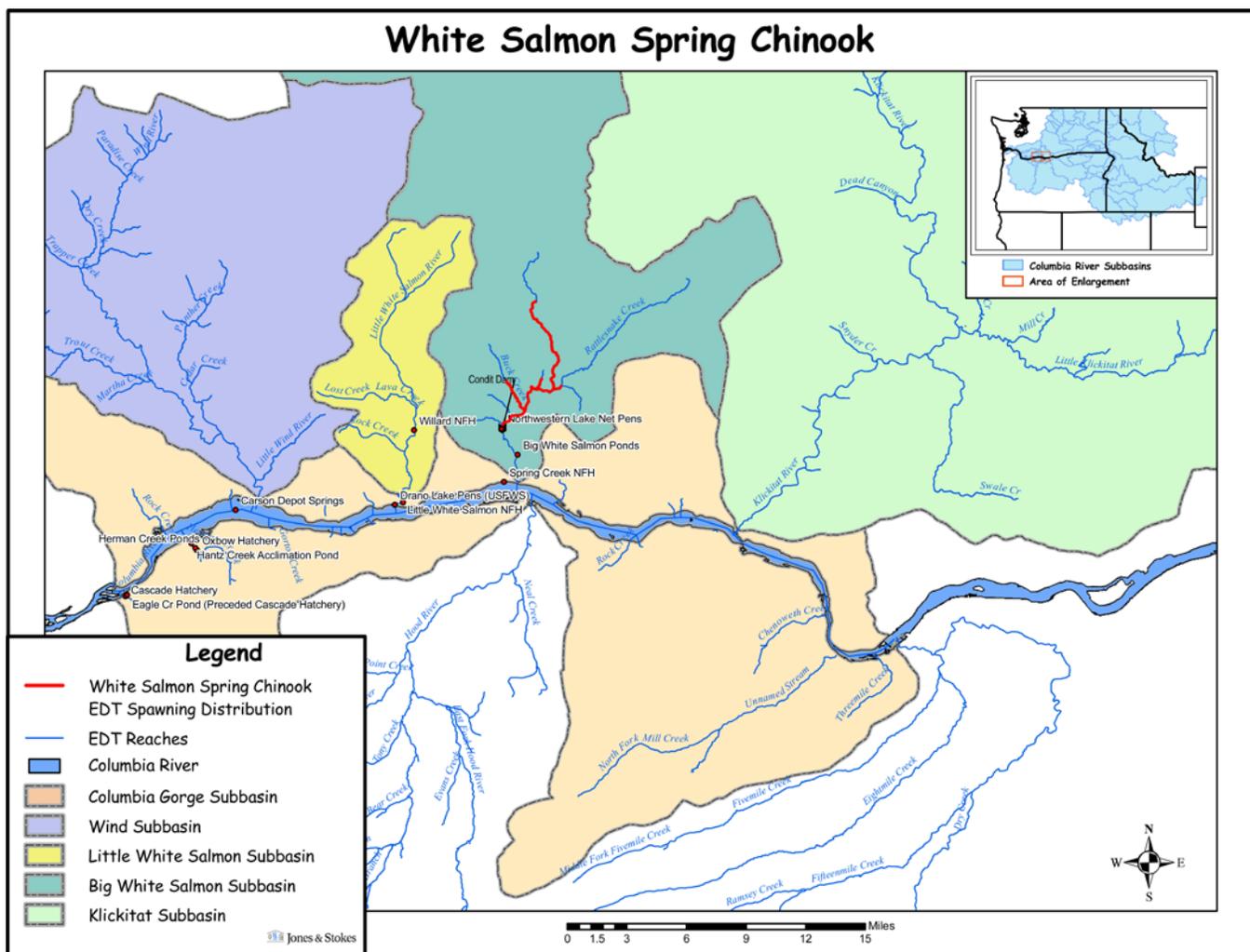
Table 1. Results of HSRG analysis of current condition and HSRG Solution for White Salmon Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|--------------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 80% | 0.00 | 128 | 0.6 | 533 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 38 | 1.2 | 159 | - |
| HSRG Solution | None None | - | 0% | 0% | 67% | 0.00 | 317 | 1.4 | 408 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 65% | 0.00 | 352 | 1.5 | 452 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

White Salmon Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 White Salmon Spring Chinook

Chinook salmon are native to the White Salmon River (WDF et al. 1993). Their historical distribution extended from the mouth up to above Husum Falls (RM 12) in the mainstem, and Rattlesnake Creek. It is unclear if the Chinook salmon observed at Husum Falls were spring or fall Chinook salmon. Since Condit Dam inundated a gorge in the White Salmon River, it is unclear if barrier waterfalls existed to maintain a separation between spring and fall Chinook salmon.

Condit Dam, built in 1913 at RM 3.4, blocks access to habitat upstream. Spring Chinook were extirpated from the White Salmon subbasin, likely because of the lack of fish passage at Condit Dam. Carson stock has been released periodically in the basin since the 1980s. Spring Chinook spawning escapement is estimated from redd surveys. Escapement averages slightly more than 100 fish. Most spawners are presumed to be of hatchery origin; their reproductive success is unknown.

Spring Chinook adults return as immature fish between February and May. Eggs remain in the gravel until emergence, which occurs from February to April, depending on water temperatures. Shortly after fry colonization, juveniles begin their outmigration. Spring Chinook juvenile can continue rearing until October. Outmigration for yearlings occurs during the following spring.

For the purposes of EDT modeling, spring Chinook distribution extended from the mouth to Little Buck Creek. EDT modeling indicates wild spring Chinook abundance in the absence of harvest has declined from 871 spawners in the historic condition to no fish currently.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- **ESA Status:** White Salmon River spring Chinook are part of the Lower Columbia Chinook ESU, which was listed as Threatened under the ESA in 1999.
- **Population Description:** The White Salmon spring Chinook population is designated as a Contributing population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes current viability as Very Low with a viability goal of Low.
- **Recovery Goal for Abundance:** 400.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity (e.g., from EDT):** Productivity: 0, Capacity: 0 (with no passage at Condit Dam); Productivity: 3.1, Capacity: 871 (with passage at Condit Dam).

2.2 Current Hatchery Programs Affecting this Population

There are no spring Chinook hatchery programs targeting the White Salmon subbasin. Reintroduction of this stock would include use of an outside stock and would require passage upstream of Condit. The best stock source may be from the Klickitat; however, this location is outside the lower Columbia ESU. Criteria would need to be evaluated for appropriate source

stocks for reintroduction. The White Salmon River target of “low” recognizes the long time frame required to restore a locally-adapted natural population from an out-of-basin stock.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 31 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would be unchanged without passage at Condit Dam and would increase from 1.31 to 2.63 if passage were provided. Average abundance of natural-origin spawners (NOS) would be unchanged without Condit Dam passage and would increase from 227 to 504 with passage. Harvest contribution of the natural and hatchery populations would be unchanged without Condit Dam passage and would increase from 27 to 61 if passage were provided.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution

(Recommendations) that appeared to be consistent with manager’s goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

| |
|--|
| <p>Observations</p> <p>Currently, there are no native spring Chinook in the White Salmon River. When Condit Dam is removed, it will be necessary to reintroduce spring Chinook.</p> <p>With successful reintroduction, the stock could achieve its numeric recovery goal. Donor sources appear to be limited; the closest source is the Klickitat River, which is outside the ESU. We assume that reintroduction may include some hatchery production for a limited amount of time.</p> <p>Recommendations</p> <p>During reintroduction, it is recommended that strays from outside sources should be monitored.</p> |
|--|

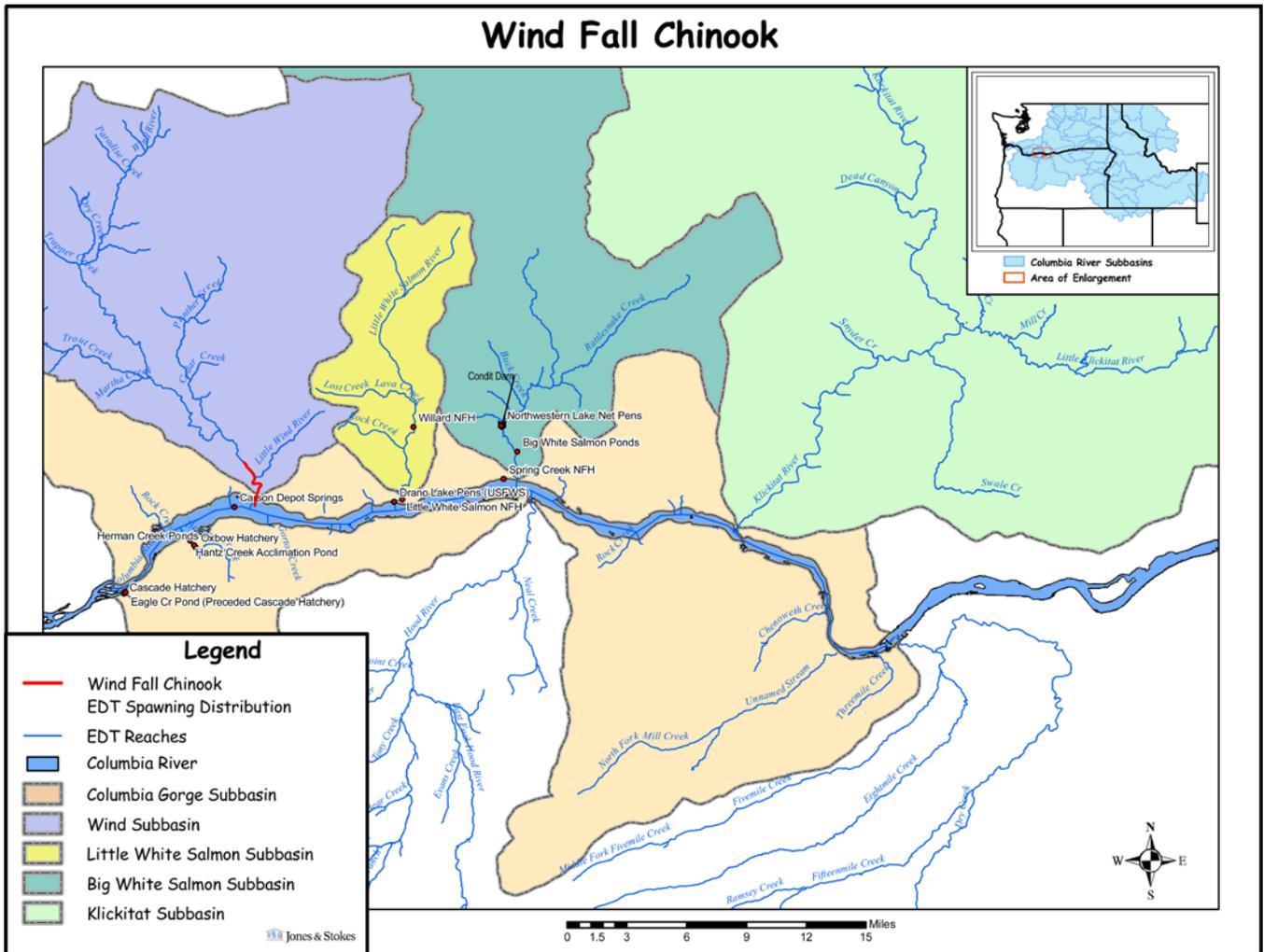
Table 1. Results of HSRG analysis of current condition and HSRG Solution for White Salmon Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 0% | 0.00 | 0 | 0.0 | 0 | 0 |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 0.00 | 0 | 0.0 | 0 | - |
| | None | | | | | | | | | |
| HSRG Solution | None | - | 0% | 0% | 0% | 0.00 | 0 | 0.0 | 0 | 0 |
| | None | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None | - | 0% | 0% | 0% | 0.00 | 0 | 0.0 | 0 | 0 |
| | None | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Wind River Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Wind River Fall Chinook

The historical Wind River adult Tule fall Chinook population is estimated at 2,500 to 3,500 fish. The current natural spawning number in the tributaries is 0 to 400 fish. A significant portion of their historic spawning habitat was inundated by the Bonneville pool. There is consistent straying to the Wind River from returning Spring Creek Hatchery tule adults and upriver bright fall Chinook and competition from hatchery and naturally produced upriver bright fall Chinook.

Natural spawning occurs primarily in the lower mainstem Wind River downstream of Shipherd Falls (RM 2). A fish ladder and trap was installed at the falls in 1956 prior to which the falls was a barrier to all species except summer steelhead. Fall Chinook have been observed up to the Carson National Fish Hatchery (NFH) at RM 18, but the majority of spawning occurs in the lower 2 miles of the mainstem; spawning may also occur in the Little Wind River (RM 1). All fall Chinook caught in the trap at Shipherd Falls are now returned to the river below the falls. WFDW biologists doubt that fall Chinook are able to swim over the falls (Kelly Harlan, WDFW, personal communication) (SaSSI 2005).

The upstream migration of Bonneville pool tule stock fall Chinook in the Columbia River occurs from August through September; peak counts at Bonneville Dam range from September 4-9. Tule fall Chinook enter the Wind River in September, where spawning occurs from mid-September to early October. Ages range from 2-year old jacks to 4-year old adults, but age 3- and 4-year old spawners predominate. Fry emerge from January through March, depending on time of egg deposition and water temperature. Fall Chinook fingerlings emigrate from the Wind River in spring. Juvenile rearing occurs near and downstream of the spawning areas. Juveniles migrate from the Bonneville tributaries in the spring and early summer of their first year (Subbasin Plan 2004).

Wind River tule fall Chinook were identified as a stock based on their distinct spawning distribution, river entry timing (September) and spawning timing, appearance (darker skin color and paler flesh on entering freshwater than is seen in bright fall Chinook), and age composition (4-year old spawners predominate). This is a mixed stock with composite production. Frequent egg transfers from the Spring Creek NFH to the Carson NFH have been made, and coded-wire tagged Spring Creek fall Chinook have been observed in the Wind River. It is believed that hybridization between native tule fall Chinook and Spring Creek fall Chinook has occurred (SaSSI 2005).

Total escapement ranged from 0 to 1,845 adults from 1964 through 2003. Spawning abundance has not improved appreciably since the 1992 stock status rating (depressed). Recent escapements have been higher, but very low escapements from 1990 through 1995 may have reduced genetic diversity within the stock. Status was rated critical in 2002, because of chronically low escapements (SaSSI 2005).

The NMFS Status Assessment for the Wind River fall Chinook indicated a 0.52 risk of 90% decline in 25 years, 0.67 risk of 90% decline in 50 years, and 0.74 risk of extinction in 50 years. Fall Chinook smolt capacity was estimated at 206,608 for the Wind River basin. Naturally produced fall Chinook fry are observed each year in the lower Wind River smolt trap, documenting successful natural spawning.

There are significant numbers of upriver bright stock fall Chinook (not part of the lower Columbia ESU) that spawn in the lower Wind River, with spawning escapements from 1988-2001 that ranged from 25-1,101 (average 397). The upriver bright spawners originated from

strays produced at Little White Salmon and Bonneville hatcheries. Most of their spawning takes place in the lower 2 miles of the mainstem Wind River below Shipherd Falls.

The upstream migration of mid-Columbia bright fall Chinook in the Columbia River occurs from August to October; with peak counts at Bonneville Dam ranging from September 4-9. Mid-Columbia bright fall Chinook enter the Wind River in late September to October and spawn from late October through November, later than the Wind River Tule fall Chinook stock. Ages range from 2-year old jacks to 6-year old adults, with age 4- and 5-year old spawners predominating. Fry emerge in the spring, depending on time of egg deposition and water temperature. Fall Chinook fingerlings emigrate from the Wind River in spring and early summer.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Wind River Tule fall Chinook are part of the Lower Columbia Chinook ESU, which was listed as Threatened under the ESA in 1994.
- Population Description: The Wind River Tule fall Chinook population is designated as a Stabilizing population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes current viability as Low with a viability goal of Low.
- Recovery Goal for Abundance: 100.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (e.g., from EDT): Productivity 4.54; Capacity 692.
- Populations Affected by this Hatchery Program Include: NA.

2.2 Current Hatchery Programs Affecting this Population

Fall Chinook hatchery releases into the Wind River were discontinued after 1976. The stock is influenced by consistent strays from the Spring Creek tule fall Chinook program and other fall Chinook hatchery programs in the Columbia Gorge.

The Spring Creek tule fall Chinook program is a segregated harvest program with an annual release goal of 15,100,000 fingerlings on-site, in the Columbia River.

Competition from hatchery and naturally produced upriver bright fall Chinook may impact natural-origin Tule Fall Chinook.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 756 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of

effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.5 to 0.9. Average abundance of natural-origin spawners (NOS) would decrease from 81 to 0. Harvest contribution of the natural and hatchery populations would go from 339 to 0.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This small tributary to the Bonneville pool contributes some spawning habitat for strays from nearby hatchery programs.

Recommendations

The HSRG has no specific recommendations for this population.

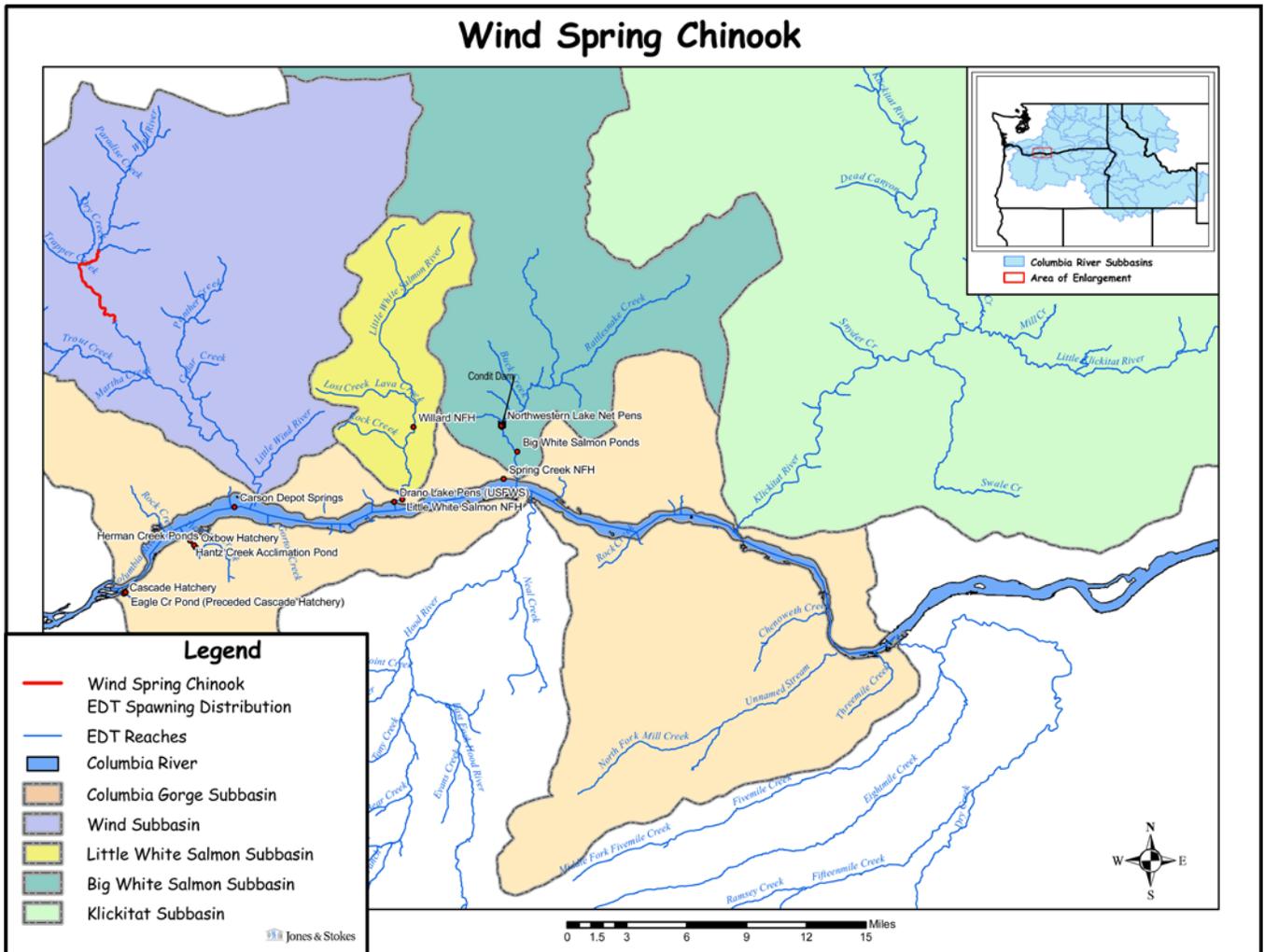
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Wind Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 87% | 0.00 | 81 | 0.5 | 339 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 0 | 0.9 | 0 | - |
| HSRG Solution | None None | - | 0% | 0% | 76% | 0.00 | 189 | 1.0 | 244 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 74% | 0.00 | 209 | 1.1 | 269 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Wind River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Wind River Spring Chinook

Spring Chinook are not native to the Wind River basin. The current population is sustained through hatchery production and any natural spawners are hatchery-origin fish. This is a non-native stock with composite production.

Spring Chinook in the Wind River are Carson National Fish Hatchery (NFH) fish that spawn naturally or are strays from other hatchery programs. Hatchery strays account for most spring Chinook spawning.

The Carson stock is a mixture of spring Chinook from the Snake River and the mid- and upper-Columbia that were collected at Bonneville Dam in the 1970s for use as broodstock at the hatchery (SaSSI 2005). Allozyme analysis has shown that Wind River spring Chinook from the Carson Hatchery resemble upper Columbia spring Chinook stocks in the Wenatchee, Entiat and Methow basins (Marshall et al. 1995).

Escapement data from 1986 to 2003 indicates a trend of increasing total escapement of spring Chinook in the Wind River (SaSSI 2005). Wind River spawning escapements from 1970-2002 ranged from 26 in 1995 to 1,936 in 1971. The average fish per mile from 1970-1984 was 21; fish per mile ranged from 4-112.

Spring Chinook enter the Wind River from late March through June and spawn from early August through mid-September. Most spawning takes place in the mainstem Wind River above Shipherd Falls from about RM 15 upstream to the mouth of Paradise Creek (SaSSI 2005). Spawner ages range from 3-year old jacks to 6-year old adults, with 4- and 5-year olds usually the dominant age class (averages are 58.5% and 38.0%, respectively). Fry emerge between November and March, depending on time of egg deposition and water temperature. Spring Chinook fry spend one full year in fresh water and emigrate in their second spring as age-2 smolts (Subbasin Plan 2004).

The stock status was not rated in 2005, because natural production is extremely low. Substantial numbers of spring Chinook spawners are observed annually; however, it is believed that spawner abundance is a reflection of the date when Carson NFH gates are closed each year. When this occurs, hatchery-origin spring Chinook are no longer able enter the hatchery; Wind River spawner numbers are thought to be a reflection of this factor, rather than of a population abundance trend. Indications are that the productivity of these spawners is negligible, perhaps as low as 2 smolts per female (SaSSI 2005).

The NMFS Status Assessment for the Wind River indicated a 0.01 risk of 90% decline in 25 years and a 0.03 risk of 90% decline in 50 years; the risk of extinction in 50 years was 0.0. Smolt density model predicted natural production potential for the Wind River was 157,533 smolts. Juvenile production from natural spawning is presumed to be low; the population is not considered self-sustaining (Subbasin Plan 2004).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Wind River Spring Chinook are not part of any Chinook ESU (HGMP 2004).
- Population Description: The Wind River spring Chinook population is not designated. In 2002, the Wind River Spring Chinook stock was considered Healthy (WDFW 2007). The stock status was not rated in 2005 because natural production is extremely low (SaSSI 2005).
- Recovery Goal for Abundance: None.
- Productivity Improvement Expectation: None.
- Habitat Productivity and Capacity (e.g., from EDT): Productivity 2.9; Capacity 196.
- Populations Affected by this Hatchery Program Include: Wind River Spring Chinook.

2.2 Current Hatchery Programs Affecting this Population

Carson NFH's spring Chinook salmon program is a segregated harvest program that was initiated in 1955. Carson NFH operates as part of the Columbia River Fisheries Development Program under *U.S. v. Oregon* and is funded through the Mitchell Act, a program to provide for the conservation of Columbia River fishery resources. The purpose of the hatchery is to successfully rear and release 1,420,000 spring Chinook salmon smolts for release on-station in the spring. Smolts are mass-released directly into the Wind River at 18 fish/pound or larger to minimize interaction with other fish populations. The Yakama Nation has expressed interest in the practice of scatter planting juvenile fish throughout the watershed for supplementation. These releases contribute to important terminal area tribal ceremonial and subsistence fisheries and non-tribal sport fisheries while providing for adequate escapement for hatchery production. The average number of hatchery-origin adults returning to the hatchery was 4,173 from 1980 through 2001 (HGMP 2004). The average egg-to-smolt survival was 86.8% from 1990 through 2001 (HGMP 2004). The average smolt-to-adult survival and recruits-per-spawner was 0.23 and 2.68, respectively, from 1982 through 1995 (HGMP 2004).

Spring Chinook are not native to the Wind River basin; the current population is sustained through hatchery production and any natural spawners are hatchery-origin fish. Production from these hatchery spawners has been observed to be very low, i.e., <2.0 smolts per female (D. Rawding, WDFW, pers. comm.).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 868 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly

greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 1.4 to 2.7. Average abundance of natural-origin spawners (NOS) would increase from 120 to 132. Harvest contribution of the natural and hatchery populations would go from 1,863 to 18.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Wind River spring Chinook population is undesignated (NA), as there is no natural population in the watershed. The hatchery program is used to supply 250,000 smolts to the Walla Walla River.

Brook trout observed in the Carson NFH spring water supply are a potential source of disease organisms (e.g., the BKD organism) for fish reared at the hatchery. This is a particular concern if fish or eggs are to be transferred from the Carson NFH to facilities or sites in other watersheds.

Recommendations

Due to disease concerns, the HSRG recommends eliminating brook trout from the hatchery's water supply. If this is not possible, then managers could carry out a regular program to keep the trout population in the hatchery's spring water supply at the lowest levels possible.

The HSRG supports the USFWS program to PIT-tag a representative portion of the spring Chinook it releases. The purpose of this program is to develop in-season management information. All fish currently are mass-marked and a portion is coded-wire tagged to monitor harvest contribution, stray rates and to provide other relevant biological information.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Wind River Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 73% | 0.00 | 120 | 1.4 | 16 | 0 |
| | Seg Harv | 1,145.0 | 80% | | | | | | 1,847 | 671 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 132 | 2.7 | 18 | - |
| HSRG Solution | None None | - | 0% | 0% | 76% | 0.00 | 124 | 1.4 | 17 | 0 |
| | Seg Harv | 1,404.4 | 80% | | | | | | 2,202 | 1,116 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 75% | 0.00 | 137 | 1.5 | 18 | 0 |
| | Seg Harv | 1,404.4 | 80% | | | | | | 2,202 | 1,116 |

1 Lower Columbia Bonneville Fall Chinook

The lower Columbia Bonneville fall Chinook population is a hatchery population that is not included as part of the Lower Columbia River Chinook ESU. This population has no viability or recovery goals.

2 Current Conditions

2.1 Current Population Status and Goals

The lower Columbia Bonneville fall Chinook population is a hatchery population that is not included as part of the Lower Columbia River Chinook ESU. The population is maintained from returns of hatchery-origin adults to the Bonneville hatchery.

- ESA Status: This population is not listed.
- Population Description: This is a hatchery population maintained through hatchery returns. There is no natural population associated with the Bonneville Hatchery program. This is a segregated hatchery population and as such, there is no associated natural productivity or capacity.
- Current Viability Rating: Because there is no natural population, there is no current or future viability rating.
- Recovery Goal for Abundance: NA.
- Productivity Improvement Expectation: NA.
- Habitat Productivity and Capacity (from EDT): NA.

2.2 Current Hatchery Programs Affecting this Population

The program attempts to meet harvest goals through the release of approximately 4.5 million fingerlings at the Bonneville Hatchery. Releases currently are not mass marked with an adipose clip, but a total of 100,000 fish are coded-wire tagged. Managers planned to initiate mass marking with the 2007 release. The Bonneville Hatchery program is a segregated harvest program and broodstock is maintained from fish returning to the facility. Some natural-origin fish may be inadvertently collected for broodstock at the hatchery trap.

The hatchery program began in 1977 with the capture of adult fall Chinook passing Bonneville Dam and returning to the Bonneville Hatchery, as well as fish from the Priest Rapids Hatchery. The fall Chinook collected at Bonneville Dam were destined for spawning areas in the Columbia River above John Day Dam and were identified as up-river brights (URB). In addition to facility returns, broodstock have been imported from Priest Rapids Hatchery when escapement was not met locally.

Incubation, rearing and release for this program occur at Bonneville Hatchery. Broodstock also supports the Ringold Springs and Umatilla River programs. Mating protocols use single family pairing, but a few jacks are used for spawning. Total survival from the Bonneville Hatchery program averaged 0.23% from brood years 1989 through 1997. On average, the program contributes approximately 5,200 fish annually to harvest. Hatchery escapement slightly exceeds the broodstock needs for the existing programs.

Estimated number of hatchery strays affecting this population: NA

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Since this is a hatchery population, that analysis is not applicable. However, impacts to other natural spawning populations are a concern and will be described in reports for those populations. The effect of no fall Chinook production at the Bonneville Hatchery would be a decrease in harvest contribution from approximately 6,500 to zero. In addition, harvest would be lost from any program supported by Bonneville Hatchery returns.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is an out-of-ESU population released into the lower river. This program is used to supply upriver bright releases upstream of Bonneville Dam.

Information about the scale and distribution of straying from this hatchery population was limited. Because this stock is from outside the lower Columbia River ESU, the size of the program (approximately 4.5 million fish), and the limited marking to date, there is a great deal of uncertainty as to whether program fish are adequately segregated from naturally spawning aggregates within the ESU or from fall Chinook populations above Bonneville Dam.

Co-managers are evaluating the option of exchanging upriver bright production at Bonneville with Spring Creek tule production. Switching production from upriver brights to tules would be consistent with HSRG principles.

Recommendations

Continue the program as operated, but with 100% adipose fin-marking, increased coded-wire tagging, and increased monitoring to determine the actual contribution of hatchery strays to lower river tule populations. This recommendation applies, whether current broodstock is retained or production is switched to a segregated tule program. .

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

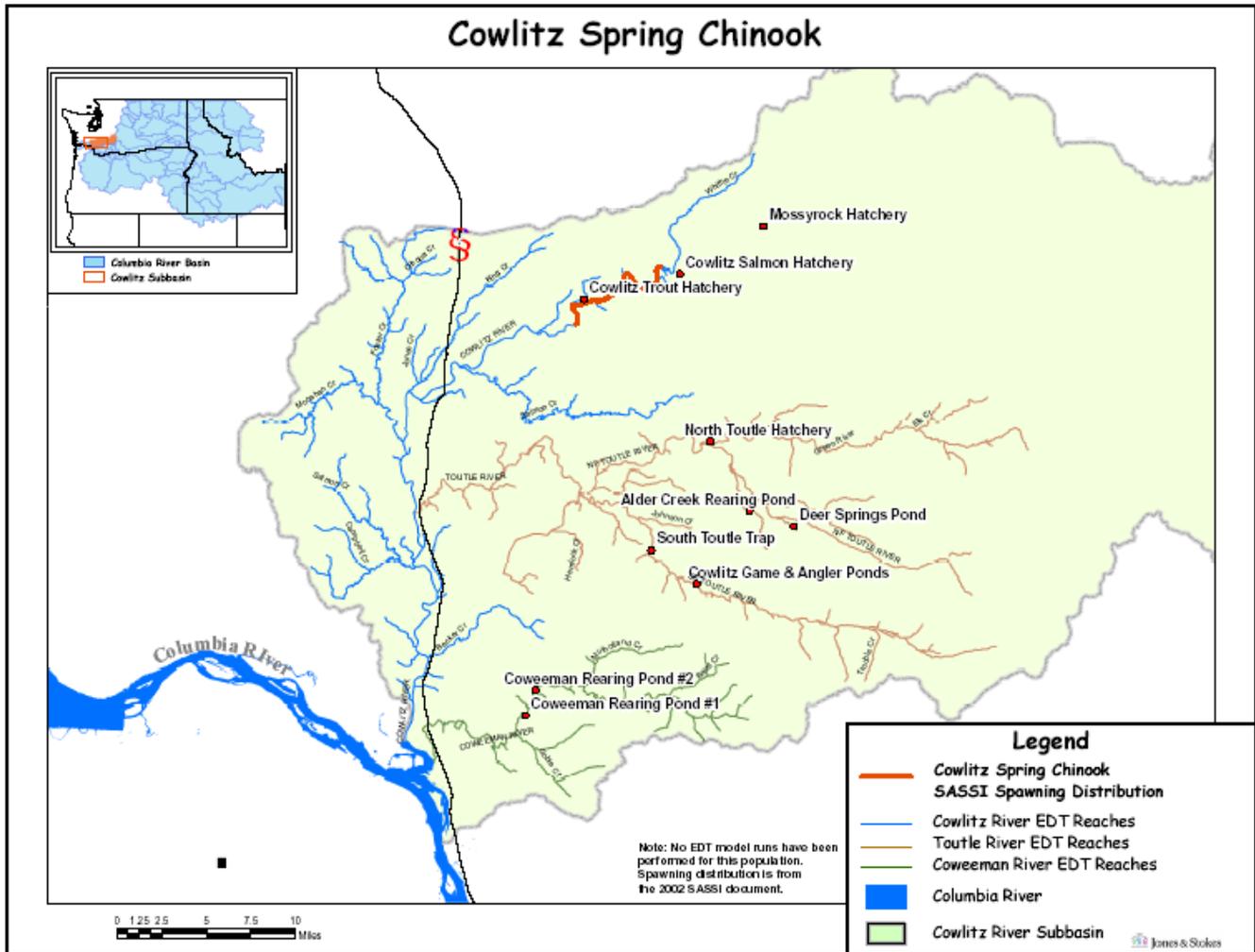
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Lower Columbia Bonneville Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 4,493.1 | 90% | | | | | | 6,446 | 2,490 |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 4,493.1 | 90% | | | | | | 6,446 | 2,490 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 4,493.1 | 90% | | | | | | 6,446 | 2,490 |

Hatchery Scientific Review Group Review and Recommendations

Cowlitz Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Cowlitz Spring Chinook

Lower Cowlitz spring Chinook were identified as a stock based on their distinct spawning distribution and early spawning timing. Historically, all spawning occurred above the three dams on the mainstem Cowlitz in the area above Packwood and in the Cispus River between Iron and East Canyon creeks. Natural spawning now occurs primarily within an eight-mile stretch between the Cowlitz Trout Hatchery on Blue Creek and the Cowlitz Salmon Hatchery. Some adult fish are now transported to various sites above the dams as part of a restoration project. Spawning generally occurs from late August through early October.

No genetic analysis has been done on naturally-spawning Lower Cowlitz spring Chinook. Allozyme analysis of the hatchery population sampled in 1982 and 1987 showed them to be genetically similar to, but distinct from, Kalama Hatchery and Lewis River wild spring Chinook and distinct from all other Columbia River spring Chinook stocks (WDF and WDW 1993).

Hatchery spring Chinook are integrated with the Upper Historic population under NOAA's proposed listing determination (69 FR 33102 June 14, 2004). The current spring Chinook hatchery stock is listed as a core genetic legacy population in the Cowlitz system (Myers et al. 2002), and as having core/legacy status (McElhany et al. 2003). Natural escapement levels in the lower river below the barrier dam (which include hatchery-origin fish) are typically only 200 to 400 fish (SaSSI 2002), although escapement in 2003 and 2004 increased significantly (Table 3). Estimates of adults above Mayfield Dam in the 1960s indicated approximately 9,900 spring Chinook (Serl and Morrill 2004). Currently, significant numbers of adults are being transported and released into the upper watershed as part of the reintroduction efforts. Current productivity in the upper system is approximately 225,000 smolts, although less than 40,000 to 45,000 smolts (19%) can be collected at the Cowlitz Falls Fish Collection Facility.

2 Current Conditions

2.1 Current Population Status and Goals

Three populations comprise the Cowlitz spring Chinook: the Upper Cowlitz River, Cispus River and the Tilton River populations.

- **ESA Status:** These populations are listed as threatened and are part of the Lower Columbia Chinook ESU.
- **Population Description:** The stocks make up three of the nine spring Chinook stocks in the ESU. The Upper Cowlitz and Cispus River populations are designated as Primary populations and the Tilton River population is considered a Stabilizing population (LCSR&SP 2004). The hatchery stock maintained at the Cowlitz Salmon Hatchery is considered a core genetic legacy population.
- **Current Viability Rating:** Upper Cowlitz population: Low, with a goal to achieve a High+ rating. Cispus River population: Low, with a goal to achieve a High+ rating. Tilton River population: Very Low, with a goal to maintain a Very Low rating.
- **Recovery Goal for Abundance:** 7,200 naturally spawning fish.
- **Productivity Improvement Expectation:** There is no expectation cited for productivity improvement in the recovery plan.
- **Habitat Productivity and Capacity (from EDT):** Productivity 2.40; Capacity 6,530.

2.2 Current Hatchery Programs Affecting this Population

The program currently releases approximately 1.26 million yearlings, including 55,000 fish released from the Friends of the Cowlitz' Wallace Pond net pens located at RM 25.5 on the Cowlitz River. Approximately 930 broodstock are needed to support the in-river release program. This stock is also currently used to support a select area fishery program at the Deep River net pens, providing 200,000 eggs for this program. Up to 2,000 adults and 300,000 fingerling spring Chinook are released in the upper watershed for a reintroduction effort. There is no restriction on using hatchery-origin adults or juveniles for reintroduction until specific fish passage survival goals are met. The broodstock for the current program is of local origin and is believed to be a mixture of all historic Cowlitz River spring Chinook populations. Broodstock is collected from volitional returns to the Cowlitz Salmon Hatchery at RM 49. No natural-origin broodstock is currently collected. All natural-origin returns are currently used for the reintroduction program in the upper watershed, using adult supplementation.

The Cowlitz River Hydroelectric Project Settlement Agreement prioritizes restoring ecosystem integrity with the restoration and recovery of wild, indigenous salmonid stocks, including ESA listed and unlisted stocks. Success of reintroduction efforts may lead to a significant investment in volitional fish passage in the future.

This hatchery program:

- Uses single family pairing.
- Incorporates jacks into the broodstock at a rate of approximately 2%.
- Is conducting a juvenile time/size of release study to evaluate differences in survival and life history traits for spring Chinook released at 4, 8, and 16 fish per pound.
- The current hatchery program is described as an integrated harvest program. Since no natural-origin fish are included in the hatchery broodstock, the current proportionate natural influence (PNI) is zero. The projected estimate of pHOS (including strays from all hatchery programs) is 37%. The estimated adjusted productivity (with harvest and fitness factor effects from AHA) is 0.74. The projected average natural-origin escapement is 625 fish. The average harvest contribution from the current program is estimated to be 2,511 fish annually. Hatchery returns are projected to exceed broodstock needs by approximately 556 fish annually, with these fish used for the upper river reintroduction program.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program – from AHA summary: 369 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – from AHA summary: 65 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example,

the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.7 to 1.5. Average abundance of natural-origin spawners (NOS) would increase from 559 to 1,369. Harvest contribution of the natural and hatchery populations would go from 2,561 to 849.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

There is an adult reintroduction program underway using fish that are uniquely marked. The HSRG modeled population conditions that assume reintroduction has been successful; however, it is uncertain what will sustain this population in the long term. Habitat is not limiting. Establishing a Primary population is a goal and the limitations are unknown. Currently, surplus adults and some fingerlings are placed in the upper basin (a segregated program). Downstream survival continues to be a problem (Cowlitz Falls juvenile collection efficiency). The lower basin is managed as a segregated harvest program. It will be critical to remove hatchery fish from the upper basin in order to sustain reintroduction.

Assuming reintroduction efforts are successful and selective harvest can be implemented, the Cowlitz River spring Chinook population can make a contribution to the recovery of the listed ESU even in the short term, sustaining a natural spawning population and supporting an integrated hatchery program for harvest consistent with Primary population objectives.

Recommendations

Continue the current program in the lower river and ongoing planned reintroduction of spring Chinook in the upper river. Manage the lower river program as a segregated program.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

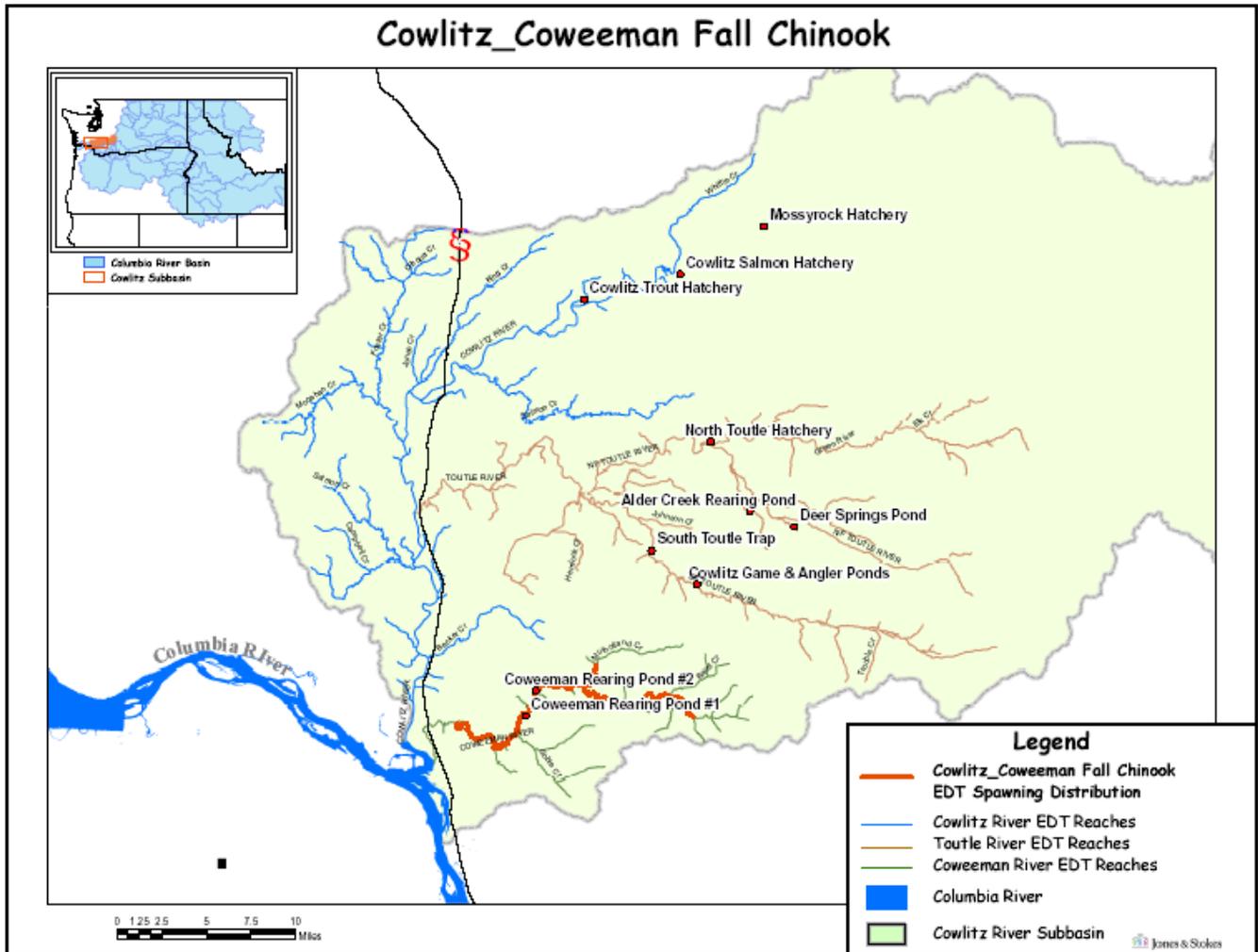
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Cowlitz Spring Chinook . The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Harv | 1,263.6 | 80% | 0% | 38% | 0.00 | 559 | 0.7 | 2,561 | 575 |
| | Seg Harv | - | 0% | | | | | | - | - |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 1,369 | 1.5 | 849 | - |
| HSRG Solution | None | - | 50% | 95% | 0% | 1.00 | 1,308 | 1.4 | 811 | 0 |
| | Seg Harv | 1,263.6 | 95% | | | | | | 2,214 | 846 |
| HSRG Solution w/ Improved Habitat | None | - | 50% | 95% | 0% | 1.00 | 1,780 | 1.6 | 1,103 | 0 |
| | Seg Harv | 1,263.6 | 95% | | | | | | 2,214 | 846 |

Hatchery Scientific Review Group Review and Recommendations

Cowlitz - Coweeman Fall Chinook Population Population and Related Hatchery Programs

January 31, 2009



1 Cowlitz Fall Chinook (Coweeman)

Stock status was rated Depressed in 2002, because of chronically low escapements and a short-term severe decline in 1998, 1999 and 2000. Most tule fall Chinook stocks, such as Coweeman fall Chinook, experienced poor survival in the 1990s. The escapement goal for the Coweeman is 1,000 adults. Generally, this goal has not been met. Recently, six miles of index areas have been added to the database. Therefore, new data are not comparable to older data. The Coweeman was identified as Depressed as a result of the low escapement in recent years. Most spawning occurs from the Jeep Club bridge upstream to Mulholland Creek. Spawning occurs from late September to mid-November.

Allozyme analysis of Coweeman fall Chinook spawners sampled in 1996 and 1997 showed that they are significantly different from all other Columbia Basin Chinook stocks examined, including lower Columbia River hatchery fall Chinook such as Cowlitz (Myers et al. 2002).

This is a native stock with wild production. In the 1992 SaSSI, Coweeman fall Chinook were characterized as being of mixed native and non-native-origin with composite production based on a history of releases of Spring Creek, Washougal and Toutle hatchery Chinook between 1951 and 1979 (SaSSI 2002).

2 Current Conditions

2.1 Current Population Status and Goals

- **ESA Status:** This population is listed as threatened and is part of the Lower Columbia Chinook ESU.
- **Population Description:** The Coweeman population is one of twenty fall Chinook (tule) populations in the ESU, and is designated as a Primary population (LCSR&SP 2004). It is one of two tule populations without a history of significant hatchery influence and is considered a genetic legacy population.
- **Current Viability Rating:** Medium, but the goal is to achieve a rating of High+.
- **Recovery Goal for Abundance:** 3,600 naturally spawning fish.
- **Productivity Improvement Expectation:** The recovery plan (LCSR&SP 2004) provides an expectation of an approximately 70% improvement in productivity and capacity for this stock.
- **Habitat Productivity and Capacity (from EDT):** Productivity 4.33; Capacity 2,376.

2.2 Current Hatchery Programs Affecting this Population

This population is one of only two tule populations without a history of significant hatchery influence and is considered a genetic legacy population.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 21 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 1.7 to 2.1. Average abundance of natural-origin spawners (NOS) would increase from 488 to 696. Harvest contribution of the natural and hatchery populations would go from 489 to 698.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This has been designated as a Primary population. Habitat productivity and abundance must be improved to achieve conservation goals. There is apparently a low proportion of hatchery strays in the natural spawning escapement.

Recommendations

This population should continue to be managed for natural production. Monitoring should occur to assure that the influence of other hatchery populations is consistent with its primary population designation.

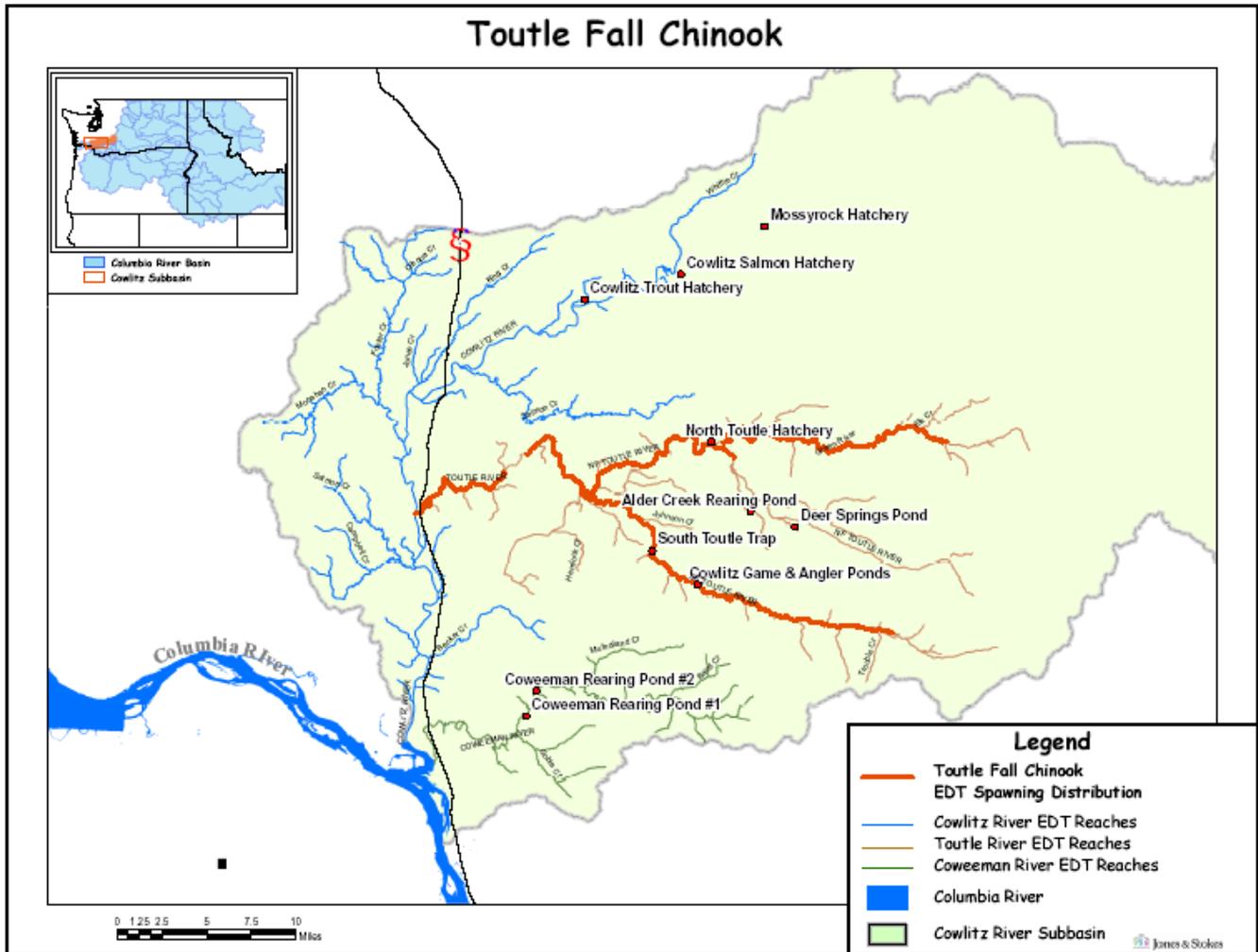
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Cowlitz-Coweeman Fall Chinook . The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 3% | 0.00 | 488 | 1.7 | 489 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 696 | 2.1 | 698 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 1,123 | 2.8 | 535 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 1,311 | 3.1 | 624 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Cowlitz - Toutle Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Cowlitz (Toutle) Fall Chinook

About 20 miles of spawning and rearing area are available above the hatchery trap on the Green River (excluding tributaries) (WDF 1973). Natural spawners (hatchery and natural-origin) from 1964 through 1979 averaged 42 percent (equal to 4,517 fish) of the Toutle subbasin spawners, which were estimated at 10,756 fish (Kreitman 1981 as cited in WDW 1990). The spawning grounds were destroyed by the 1980 eruption of Mt. St. Helens. The Toutle River Hatchery, located 0.5 miles up the Green River, began collecting broodstock again in 1990. Surplus hatchery fish were released upstream of the hatchery to spawn naturally. Broodstock has been from a mixture of sources since the 1980 eruption (WDW 1990). The estimated annual escapement of fall chinook in the Toutle and its tributaries in the early 1950s was 6,500.

An estimated 80 percent of the total Toutle fall Chinook run spawned in the lower five miles of the mainstem Toutle (WDF 1951). Annual surveys show the greatest abundance of adult fall Chinook on the North Fork Toutle River to be in a five-mile stretch from the Toutle River Hatchery (0.5 miles up the Green River) to Kid Valley Park on the North Fork Toutle. An average spawning escapement of 2,700 fall Chinook was observed from 1968 to 1972, with a sharp increase beginning in 1971. Fall Chinook were observed as far upstream as Spirit Lake (WDF 1973). An average of 10,756 adults returned each year to the Toutle River basin from 1964 through 1979 (pre-eruption). Of these, natural spawners of both hatchery and natural-origin in the Toutle subbasin averaged 6,573 fish from 1964 through 1979 with the following distribution: 4.8% from the mainstem, 3.8% South Fork Toutle, 49.4% North Fork Toutle, and 42% Green River (Kreitman 1981 as cited in WDW 1990). Spawning areas in the mainstem Toutle and North Fork rivers, as well as the Green River, were destroyed by the 1980 eruption of Mt. St. Helens (WDW 1990). DeVore (1987) assumed that 12.8% of the Toutle River fall Chinook spawned naturally and estimated that an average of 1,528 naturally-spawning fall Chinook entered the Toutle subbasin (HGMP 2004).

2 Current Conditions

2.1 Current Population Status and Goals

- **ESA Status:** This population is listed as threatened and is part of the Lower Columbia Chinook ESU.
- **Population Description:** This stock is one of 23 fall Chinook stocks in the ESU and is designated as a Stabilizing population (LCSR&SP 2004). Historically, this was a large tule fall Chinook population. There is significant history of hatchery transfers from other lower Columbia subbasins. The primary historical spawning areas of the North Fork and mainstem Toutle remain impacted by the eruption of Mt. St. Helens.
- **Current Viability Rating:** Low, with a goal to maintain a Low rating.
- **Recovery Goal for Abundance:** 1,000 naturally spawning fish.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity (from EDT):** Productivity 3.10; Capacity 6,748.

2.2 Current Hatchery Programs Affecting this Population

The North Fork Toutle Salmon Hatchery currently releases approximately 2,500,000 fingerlings. Approximately 1,120 broodstock are needed to support the program. Broodstock collection, adult

holding, incubation and rearing all occurs on-station. The program is described as an integrated harvest program. Some natural-origin fish may be inadvertently collected for broodstock, but the level is probably insignificant since most natural spawning is of hatchery-origin fish.

The marking/tagging level of the hatchery release does not allow the identification of natural-origin fish in the broodstock, as only 90,000 juveniles are adipose-clipped and coded-wire tagged.

Hatchery operations include:

- Using pooled gametes from 5 males and 5 females for mating protocols
- Incorporating jacks into the broodstock at a rate of approximately 2%
- Using a rearing flow index of approximately 1.6, higher than recommended

Overall survival averaged 0.15% for brood years 1995 – 1998. Total fishery contribution averaged approximately 3,750 fish per year for these brood year releases. Hatchery returns are projected to exceed broodstock needs by approximately 900 fish annually.

The current estimate of the proportion of hatchery-origin spawners (pHOS) in the total spawning population is 33%. The estimated adjusted productivity (with harvest and fitness factor effects) is estimated to be 0.77. The projected average natural-origin escapement is 570 fish annually. The projected annual harvest contribution is 2,900 fish. Hatchery returns are projected to exceed broodstock needs by approximately 900 fish annually.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program:NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 370 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.8 to 1.5. Average abundance of natural-origin spawners (NOS) would increase from 510 to 1,253. Harvest contribution of the natural and hatchery populations would go from 2,892 to 1,257.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Toutle Chinook are designated a Stabilizing population. Historically, this was an important fall Chinook population with significant remaining habitat productivity and abundance.

The Cowlitz (Toutle) fall Chinook population appears to be able to reach its conservation goal under numerous scenarios. With implementation of selective harvest regimes, the composite natural/hatchery population can make a significant contribution to harvest and still provide substantial conservation benefits, even though much of the historic spawning area for this stock is still significantly affected by the eruption of Mt. St. Helens.

The challenge to achieving conservation standards is collecting natural-origin broodstock for an integrated hatchery program.

Recommendations

Managers should consider designating this as a Primary population, given its available habitat. An integrated harvest program releasing 1.7 million fish (pNOB 25%) could be operated consistent with a Primary population designation.

Develop the capability to meet the challenge of collecting natural-origin broodstock that is representative of the entire population. This includes a monitoring program to estimate composition on the spawning grounds.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with.

However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

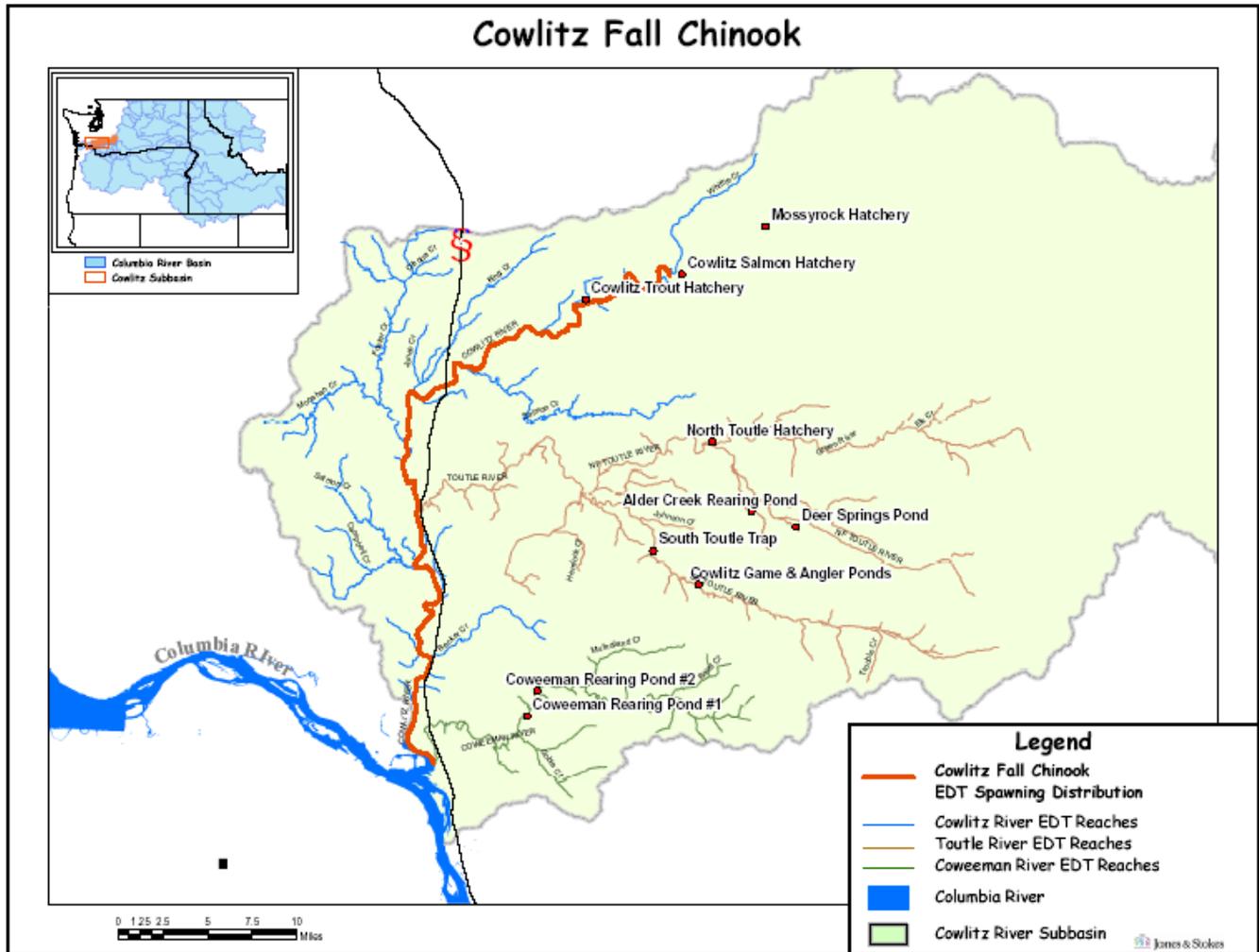
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Toutle Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 37% | 0.00 | 510 | 0.8 | 512 | 0 |
| | Seg Harv | 2,500.4 | 85% | | | | | | 2,380 | 898 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,253 | 1.5 | 1,257 | - |
| HSRG Solution | Int Harv | 1,561.4 | 85% | 0% | 10% | 0.71 | 1,713 | 1.8 | 2,500 | 638 |
| | Seg None | - | 0% | | | | | | - | - |
| HSRG Solution w/ Improved Habitat | None None | 1,561.4 | 85% | 0% | 8% | 0.00 | 2,433 | 2.1 | 2,842 | 638 |
| | Seg Harv | - | 0% | | | | | | - | - |

Hatchery Scientific Review Group Review and Recommendations

Cowlitz Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Cowlitz Fall Chinook

Stock status was rated Depressed in 2002, because of chronically low escapements. Natural spawning abundance is more a reflection of the size of returns to the Cowlitz Salmon Hatchery and stray rates than of natural production. The natural spawning escapement goal is 3,000 adults. Until 2001, the goal had not been met since 1989.

With the construction of Mayfield Dam (1962), spawning is now limited to mainstem waters below the dam. Spawning generally occurs from late September to mid-November.

No genetic analysis has been done on naturally-spawning Cowlitz fall Chinook. Allozyme analysis of Cowlitz Hatchery fall Chinook sampled in 1981, 1982 and 1988 showed that they were similar to, but distinct from, Kalama hatchery fall Chinook and distinct from all other Washington Chinook examined (WDF and WDW 1993, SaSSI 2002).

In 1951, the fall Chinook escapement to the Cowlitz River and tributaries was estimated at 31,000, with the following distributions: 10,900 to the mainstem Cowlitz and its minor tributaries, 8,100 to the Cispus, 500 to the Tilton, 6,500 to the Toutle, and 5,000 to the Coweeman (WDF 1951). Forty-six percent of the fall Chinook run in the Cowlitz River was estimated to have come from above Mayfield Dam in 1950 to 1961, and 28% of the spawning grounds were inundated by Mayfield and Mossyrock reservoirs (Easterbrooks 1980). Age ranges from 2-year-old jacks to 6-year-old adults, with dominant adult age of 3, 4, and 5 (averages are 16.49%, 58.05%, and 19.31%, respectively). Natural spawning abundance is more a reflection of the size of returns to the Cowlitz Salmon Hatchery and stray rates than of natural production. The natural spawning escapement goal is 3,000 adults. Until 2001, the goal had not been met since 1989 (SaSSI 2002). In 2002, escapement was 1,427, while 10,329 were reported for 2003 and 4,466 for 2004. Most of the spawning takes place between the Kelso Bridge and the Cowlitz Salmon Hatchery (WDF et. al. 1993). Fall Chinook will not be used in the upper Cowlitz while the spring Chinook evaluation is ongoing, but adults are taken to the Tilton River. Fall Chinook production occurs in the Tilton River and Mayfield Lake tributaries because adults are transported by Tacoma Power. Smolts are collected at Mayfield Dam (HGMP 2004).

2 Current Conditions

2.1 Current Population Status and Goals

- **ESA Status:** This population is listed as threatened and is part of the Lower Columbia Chinook ESU.
- **Population Description:** This stock is one of 23 fall Chinook stocks in the ESU and is designated as a Contributing stock (LCSR&SP 2004). Historically, this is likely the most significant lower Columbia fall Chinook population. There have been few out of basin transfers into the hatchery stock. The natural population has consistent contributions from stray Lewis River natural spawners.
- **Current Viability Rating:** Low+, with a goal to achieve a Medium rating.
- **Recovery Goal for Abundance:** 2,300 naturally spawning fish.
- **Productivity Improvement Expectation:** 20%, based on the recovery plan (LCSR&SP 2004).
- **Habitat Productivity and Capacity (from EDT):** Productivity 5.9; Capacity 8,873.

2.2 Current Hatchery Programs Affecting this Population

The program currently releases approximately 5,000,000 fingerlings from the Cowlitz Salmon Hatchery. Approximately 2,200 broodstock are needed to support the program. Adults are also planted in the Tilton River and Mayfield Lake. The level of adult releases in the upper watershed has varied from just over 100 fish in 1997 to over 5,000 fish in 2002.

Historically, hatchery broodstock have been mostly native Cowlitz fall Chinook. However, four non-native plants of juvenile Chinook occurred between 1951 and 1981, including Toutle, Kalama, Big Creek, and Bonneville stocks. Broodstock is collected from volitional returns to the Cowlitz Salmon Hatchery. This is an integrated harvest program, and some natural-origin fish may be inadvertently collected for broodstock, but the level is unknown since the marking/tagging level of the hatchery release does not allow the identification of natural-origin fish. Incubation and rearing occurs on-station at the Cowlitz Salmon Hatchery.

The Cowlitz River Hydroelectric Project Settlement Agreement prioritizes restoring ecosystem integrity with the restoration and recovery of wild, indigenous salmonid stocks, including ESA listed and unlisted stocks. Success of restoration efforts may lead to significant investment in volitional fish passage in the future. Overall survival averaged 0.10% for brood years 1988 – 1999. The total fishery contribution averaged slightly more than 1,500 fish per year between 1992 and 2001.

Hatchery practices include the following:

- Hatchery strays from in-basin integrated hatchery program – from AHA summary: 1,069
- Mating protocols use pooled gametes from 2 males and 2 females.
- Jacks are incorporated into the broodstock at a rate of approximately 2%.
- The rearing flow index is approximately 1.6, higher than recommended.
- Approximately 200,000 juveniles are adipose-clipped and coded-wire tagged.

The program is described as an integrated harvest program, but does not systematically include natural-origin fish as broodstock. The current estimate of the proportion of hatchery-origin spawners (pHOS) in the total spawning population is 35%, with a proportionate natural influence (PNI) of zero. The estimated adjusted productivity (with harvest and fitness factor effects) is estimated to be 1.42. The projected average natural-origin escapement is 1,600 fish annually. The projected annual harvest contribution is 5,900 fish. Hatchery returns are projected to exceed broodstock needs by approximately 1,093 fish annually.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 1,103 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 125 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater

than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 1.4 to 2.8. Average abundance of natural-origin spawners (NOS) would increase from 2,424 to 4,294. Harvest contribution of the natural and hatchery populations would go from 6,854 to 4,305.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Currently, this is a Contributing population intended to be managed as an integrated program (4.0 million release), according to the FERC settlement agreement.

This was historically an important fall Chinook population with significant remaining habitat productivity and capacity. The Cowlitz River fall Chinook population can make a contribution to the recovery of the listed ESU, even in the short term, sustaining a natural spawning population of approximately 2,300 fish and supporting an integrated hatchery program for harvest.

Challenges to achieving conservation standards are managing spawning composition and collecting natural-origin broodstock.

Recommendations

Managers should consider designating this as a Primary population given its available habitat and genetic legacy. Develop the capability to meet the challenges of managing spawning composition and collecting natural-origin broodstock. This includes a monitoring program to estimate composition on the spawning grounds (pHOS). A hatchery program using 25% natural-origin broodstock (pNOB) and releasing 4.8 million smolts would meet this requirement.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

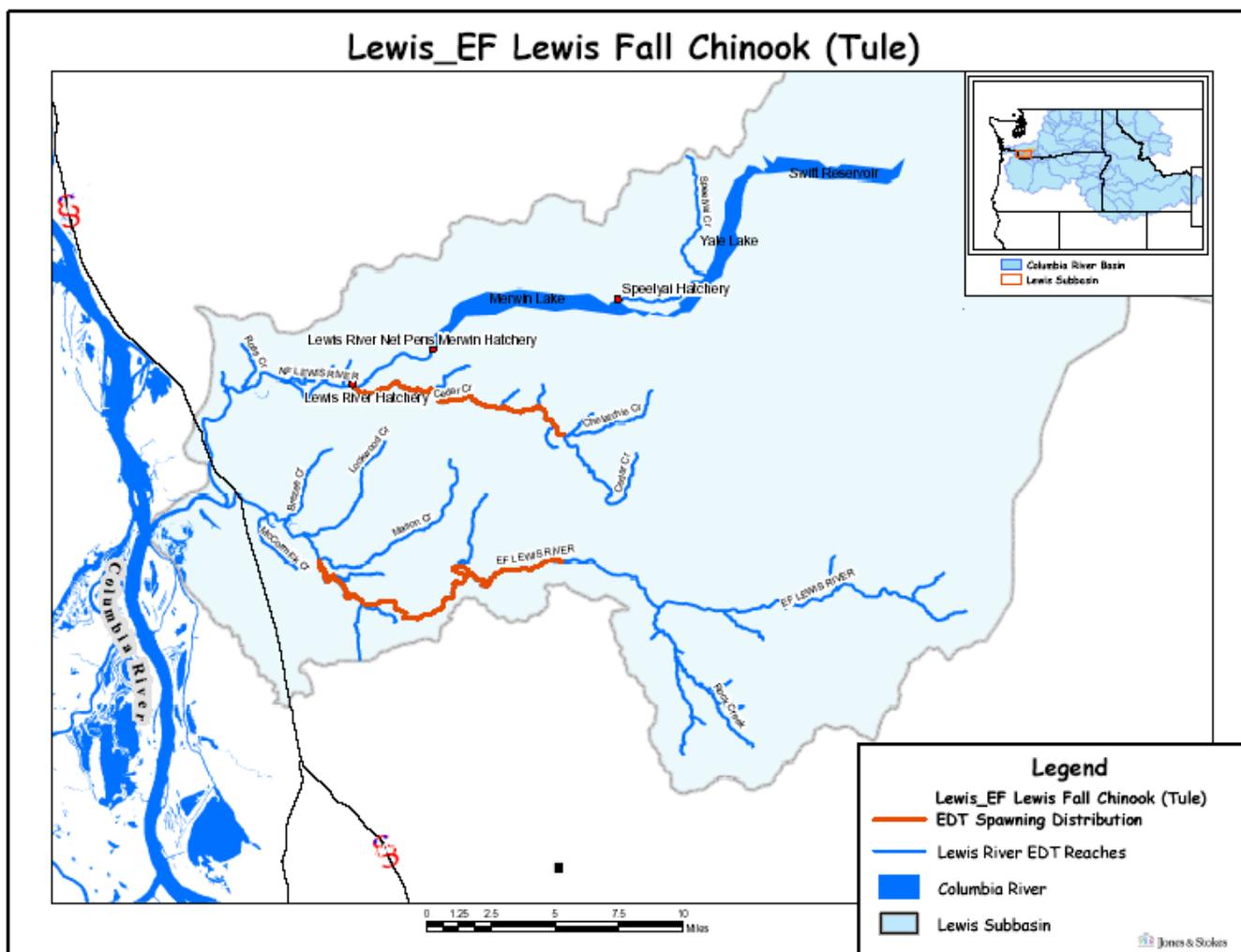
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Cowlitz Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Harv | 4,807.4 | 75% | 0% | 29% | 0.00 | 2,424 | 1.4 | 6,854 | 1,155 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 4,294 | 2.8 | 4,305 | - |
| HSRG Solution | Int Harv | 4,370.4 | 75% | 0% | 13% | 0.70 | 5,166 | 3.3 | 7,078 | 1,377 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Harv | 4,370.4 | 75% | 0% | 11% | 0.73 | 6,190 | 3.7 | 7,566 | 1,377 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

East Fork Lewis Fall Chinook (Tule) Population and Related Hatchery Programs

January 31, 2009



1 East Fork Lewis Fall Chinook (Tule)

East Fork Lewis fall Chinook were identified as a stock based on their distinct spawning distribution and spawning timing. The stock has a tule fall Chinook component and a bright fall Chinook component. Most spawning takes place in the 4-mile stretch from Daybreak Park upstream to Lewisville.

Two distinct spawning peaks are evident. Early fish spawn mainly in October, like tule fall Chinook, while late fish generally spawn from November through January, like bright fall Chinook.

Allozyme analysis has shown that East Fork Lewis fall Chinook are genetically distinct from most Lower Columbia Chinook stocks examined, but are most similar to Lewis fall Chinook. This is a native stock with wild production. Hatchery fish have never been released into the East Fork Lewis River (SaSSI 2002).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Threatened
- Population Description: This has been designated a Primary population.
- Recovery Goal for Abundance: 7,300 fish
- Productivity Improvement Expectation: The recovery plan (LCSR&SP 2004) provides an expectation of an approximately 90% improvement in productivity and capacity for this stock.
- Habitat Productivity and Capacity (e.g., from EDT): Productivity: 2.84; Capacity: 4,690
- Populations Affected by this Hatchery Population Include: None identified

2.2 Current Hatchery Programs Affecting this Population

- No hatcheries are present in this watershed.
- Modeling indicates hatchery strays from the Kalama, Washougal and Cowlitz programs could be affecting this natural population.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 145 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of

effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.2. Average abundance of natural-origin spawners (NOS) would increase from 160 to 294. Harvest contribution of the natural and hatchery populations would go from 223 to 409.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated a Primary population that is not meeting standards for this designation because of strays from out-of-basin hatchery programs. The analysis assumed a 75% removal of hatchery-origin adults from the natural spawning escapement.

Recommendations

The HSRG recommends that managers monitor the contribution of hatchery strays to spawning escapement.

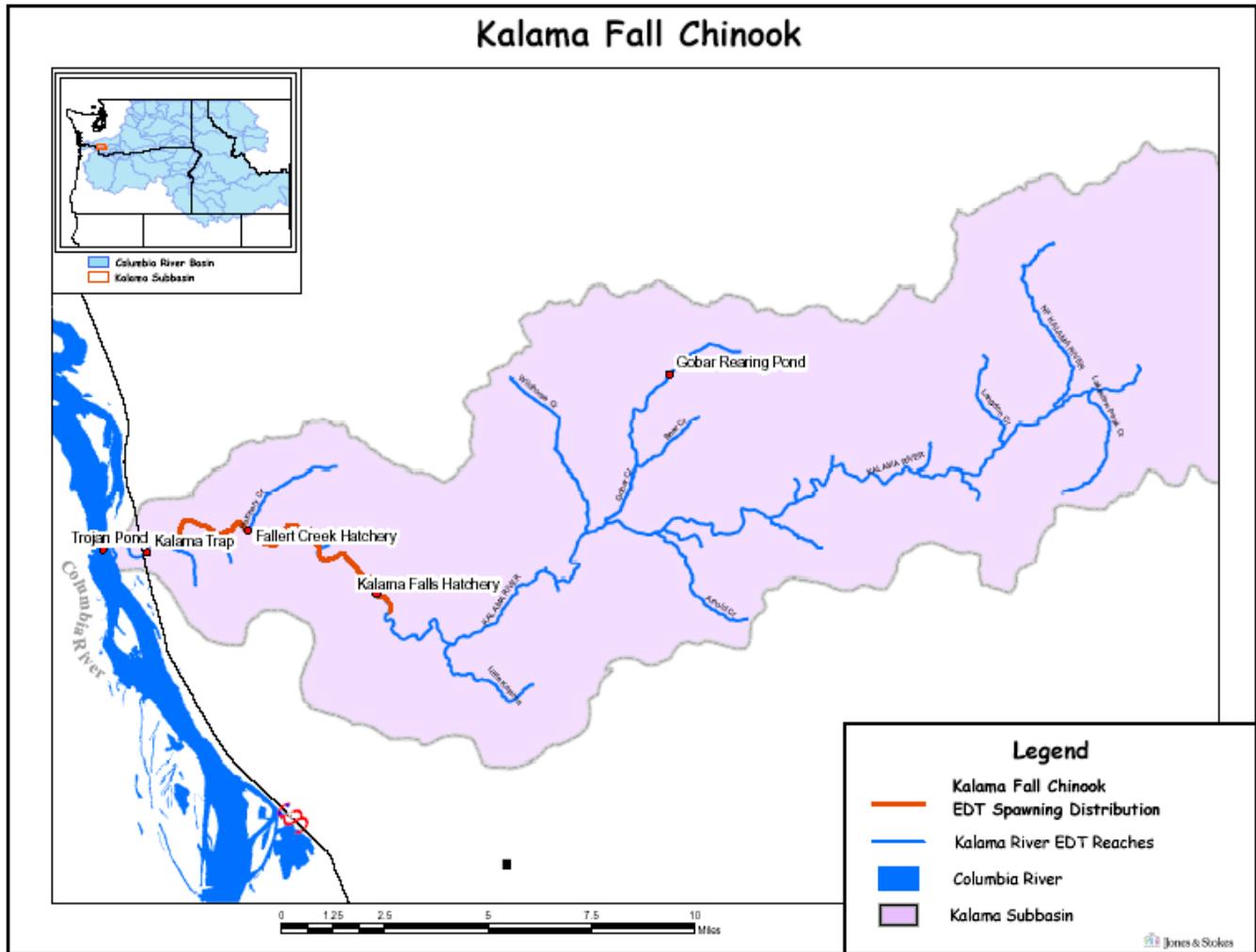
Table 1. Results of HSRG analysis of current condition and HSRG Solution for East Fork Lewis River Fall Chinook (Tule). The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 42% | 0.00 | 160 | 0.6 | 223 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 294 | 1.2 | 409 | - |
| HSRG Solution | None None | - | 0% | 75% | 1% | 0.00 | 1,526 | 1.8 | 727 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 75% | 1% | 0.00 | 1,915 | 2.0 | 912 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Kalama Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Kalama Fall Chinook

The Kalama fall Chinook population is one of 23 fall Chinook stocks in the ESU and is designated as a Primary population (LCSR&SP 2004). Fall Chinook are native to the Kalama River and there have been few introductions of out-of-basin fish. Hatchery fish have been released in the watershed since Fallert Creek Hatchery went into production. It is probable that a significant number of natural spawners are hatchery strays, and strays from other hatcheries within the GDU are common.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Kalama Fall Chinook population.

- **ESA Status:** This population is listed as threatened under the ESA and is part of the Lower Columbia Chinook ESU. It has been designated as a Primary population for ESA recovery.
- **Current Viability Rating:** Low+, with a goal of High.
- **Recovery Goal for Abundance:** 1,300 fish. The Lower Columbia recovery plan calls for habitat improvements that would increase fall Chinook productivity by about 18%.
- **Productivity Improvement Expectation:** Accounting for the current habitat productivity, operation of the current hatchery program and harvest, the adjusted productivity for the population is estimated to be 0.82 recruits/spawner.
- **Habitat Productivity and Capacity (from EDT):** Productivity 3.3; Capacity 2,370.
- **Hatchery Populations of the Same Species that may Affect This Natural Population:** Hatchery fish of Kalama origin have been released in the watershed since Fallert Creek Hatchery went into production. It is probable that a significant number of natural spawners are hatchery strays, and strays from other hatcheries within the GDU are common. The current estimate of the proportion of hatchery-origin spawners (pHOS) in the total spawning population is 69%.

2.2 Current Hatchery Programs Affecting this Population

The Kalama fall Chinook program currently releases approximately 5,000,000 fingerlings from the Fallert Creek and Kalama Falls Salmon hatcheries. Approximately 2,200 broodstock are needed to support the program.

The program is described as an integrated harvest program, and some natural-origin fish may be inadvertently collected for broodstock. The amount of such collection is unknown, because the marking/tagging level of the hatchery release does not allow identification of natural-origin fish. The HSRG's evaluation of the current program assumed that the proportion natural influence (PNI) is zero.

Broodstock for the hatchery facilities is taken from a temporary rack upstream of tidewater near Modrow Bridge. Incubation and rearing take place at both Fallert Creek and Kalama Falls. Mating protocols use pooled gametes from 5 males and 5 females. Jacks are incorporated into the broodstock at a rate of up to 2%. Approximately 90,000 juveniles are adipose-clipped and coded-

wire tagged for each release group (180,000 total). Overall survival averaged 0.05% for brood years 1995 – 1998. Hatchery returns exceed broodstock needs by approximately 2700 fish annually.

- Estimated Productivity (with harvest): 0.97
- Projected Average Natural-Origin Escapement: 600 fish.
- Average Harvest Contribution: Total fishery contribution from 1995 to 1998 was very poor, averaging approximately 850 fish per year. Fishery contributions have since improved and may now average as many as 6,500 fish annually.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 1,400 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 1.0 to 1.9. Average abundance of natural-origin spawners (NOS) would increase from 535 to 553. Harvest contribution of the natural and hatchery populations would go from 7,050 to 555.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The population has been designated a Primary population; however, it is unlikely to meet the Primary population standards, because of limited habitat for fall Chinook. If managed as a Primary population, hatchery fish should be controlled on the spawning grounds and the hatchery program would need to be revised to a small, integrated conservation program. Even with these steps, the Primary standards would not be met.

The lower river weir, which is used for broodstock collection, is not highly effective to control composition on the spawning grounds. If managed as a Primary population, a more effective weir is needed.

Recommendations

We recommend continuing the existing program (5.0 million) as a segregated harvest program, which is consistent with a Stabilizing population designation. Managers should consider a more suitable Primary population in this area, such as the Toutle or lower Cowlitz fall Chinook.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

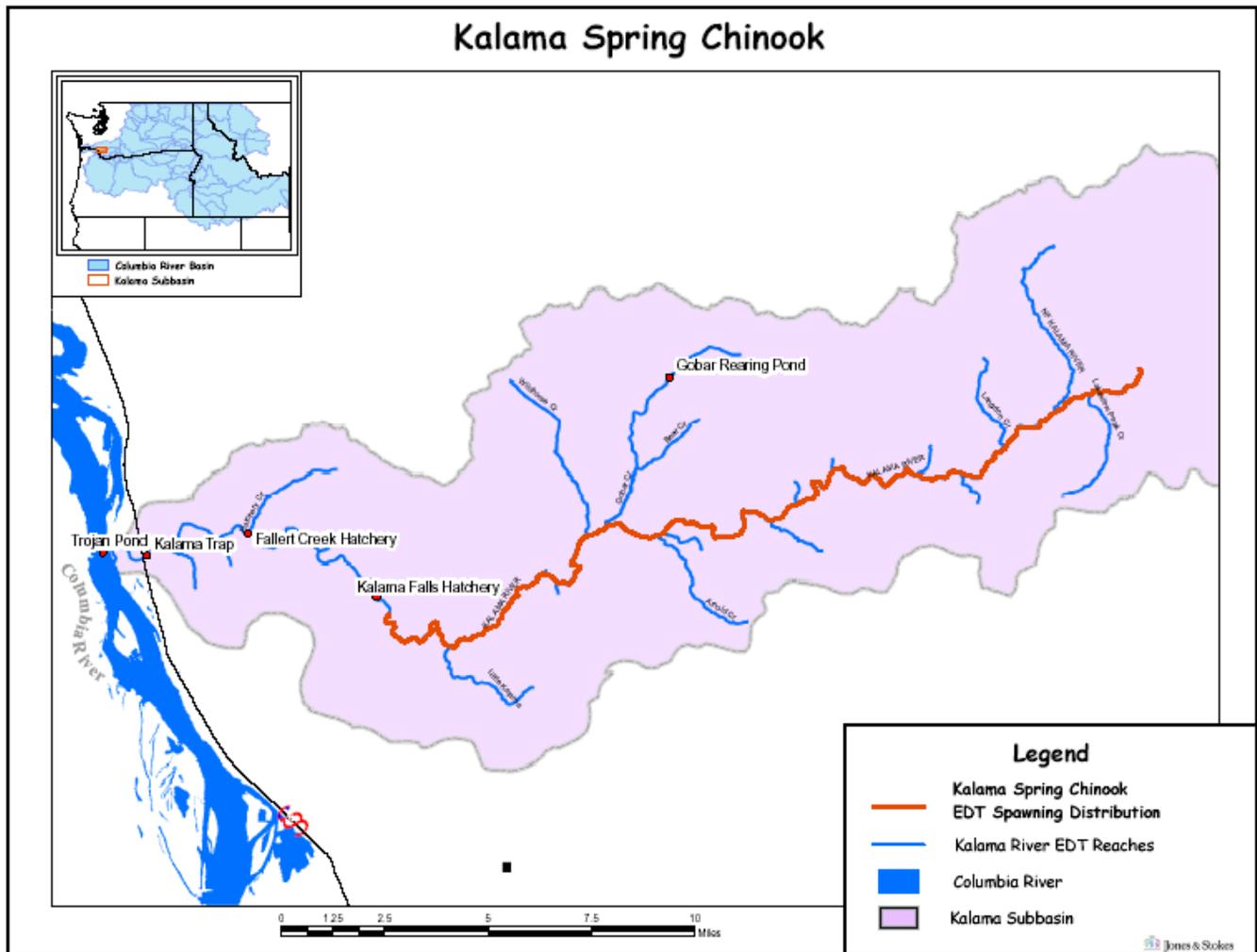
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Kalama Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|--------------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 68% | 0.00 | 535 | 1.0 | 536 | 0 |
| | Seg Harv | 5,040.0 | 75% | | | | | | 6,514 | 2,673 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 553 | 1.9 | 555 | - |
| HSRG Solution | Int None | - | 95% | 0% | 41% | 0.00 | 604 | 1.3 | 288 | 0 |
| | Seg Harv | 5,040.0 | 90% | | | | | | 7,015 | 3,196 |
| HSRG Solution w/ Improved Habitat | None None | - | 95% | 0% | 38% | 0.00 | 685 | 1.5 | 326 | 0 |
| | Seg Harv | 5,040.0 | 90% | | | | | | 7,015 | 3,196 |

Hatchery Scientific Review Group Review and Recommendations

Kalama Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Kalama Spring Chinook

Kalama River spring Chinook are part of the Lower Columbia Chinook ESU and are listed as threatened under the ESA. The population is one of the nine spring Chinook populations in the ESU and is designated as a Primary population (LCSR&SP 2004). Spring Chinook are indigenous to the Kalama River, but the historical significance of this population is uncertain. Access to the best spring Chinook spawning habitat historically was blocked by Lower Kalama Falls. A natural spawning population exists, concentrated on the mainstem between Kalama Falls and Fallert Creek hatcheries, but it is believed to be largely comprised of hatchery-origin fish.

2 Current Conditions

2.1 Current Population Status and Goals

- ESA Status: This population is listed as threatened and is part of the Lower Columbia Chinook ESU.
- Current Viability Rating: Low-, with a goal of High
- Recovery Goal for Abundance: 1,400
- Productivity Improvement Expectation: The recovery plan (LCSR&SP 2004) does not indicate any significant habitat productivity improvement is to be expected for this stock.
- Habitat Productivity and Capacity (from EDT): Productivity 1.76; Capacity 945

2.2 Current Hatchery Programs Affecting this Population

The program currently releases approximately 500,000 from Fallert Creek Hatchery and Gobar Pond. All releases are adipose-marked and approximately 250,000 are adipose-marked and coded-wire tagged. Approximately 300 broodstock, collected at the ladder at Kalama Falls Hatchery, are needed to support the program.

The Kalama River hatchery broodstock was originally taken from Cowlitz and Carson hatchery stocks in the 1970s. Since then, this stock has been propagated largely from returns to the hatchery; however, eggs and adults have been brought in from numerous lower Columbia hatcheries including Eagle Creek and Willamette (Oregon), Cowlitz and Little White Salmon Rivers.

The program uses single family pairing. Few jacks are incorporated into the broodstock. Average smolt to adult survival for the hatchery program has been 0.17% for brood years 1990 through 1998. The HGMP for this program indicates that contribution to fisheries has been extremely low, with total annual catch from the program averaging less than 300 fish for return years 1995 through 2001.

The current hatchery program is described as an integrated harvest program. However, since no natural-origin fish are included in the hatchery broodstock, the current proportionate natural influence (PNI) is zero. The current estimate of the proportion of hatchery-origin spawners (pHOS) in the total spawning population is 52%. Hatchery returns are projected to exceed broodstock needs by approximately 1,200 fish annually.

- Estimated Productivity (with harvest): 0.54.
- Projected Average Natural-Origin Escapement: 146 fish

- Average Harvest Contribution: 1,149 fish

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 267 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 69 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.5 to 1.1. Average abundance of natural-origin spawners (NOS) would decrease from approximately 160 to approximately 40. Harvest contribution of the natural and hatchery populations would go from approximately 1,700 to 25.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The population has been designated a Primary population; however, it is unlikely to meet the Primary population standards, because of limited habitat for spring Chinook. The upper Kalama basin offers the better spring Chinook habitat and currently natural fish are passed upstream to spawn. Marked fish of hatchery origin are not passed into the basin above Kalama Falls.

If managed as a primary population it may require an interim, small conservation program to preserve the population because of limited habitat productivity and capacity.

Recommendations

We recommend maintaining the current segregated harvest program (500,000 release), which is consistent with the designation as a stabilizing population (rather than a primary population).

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

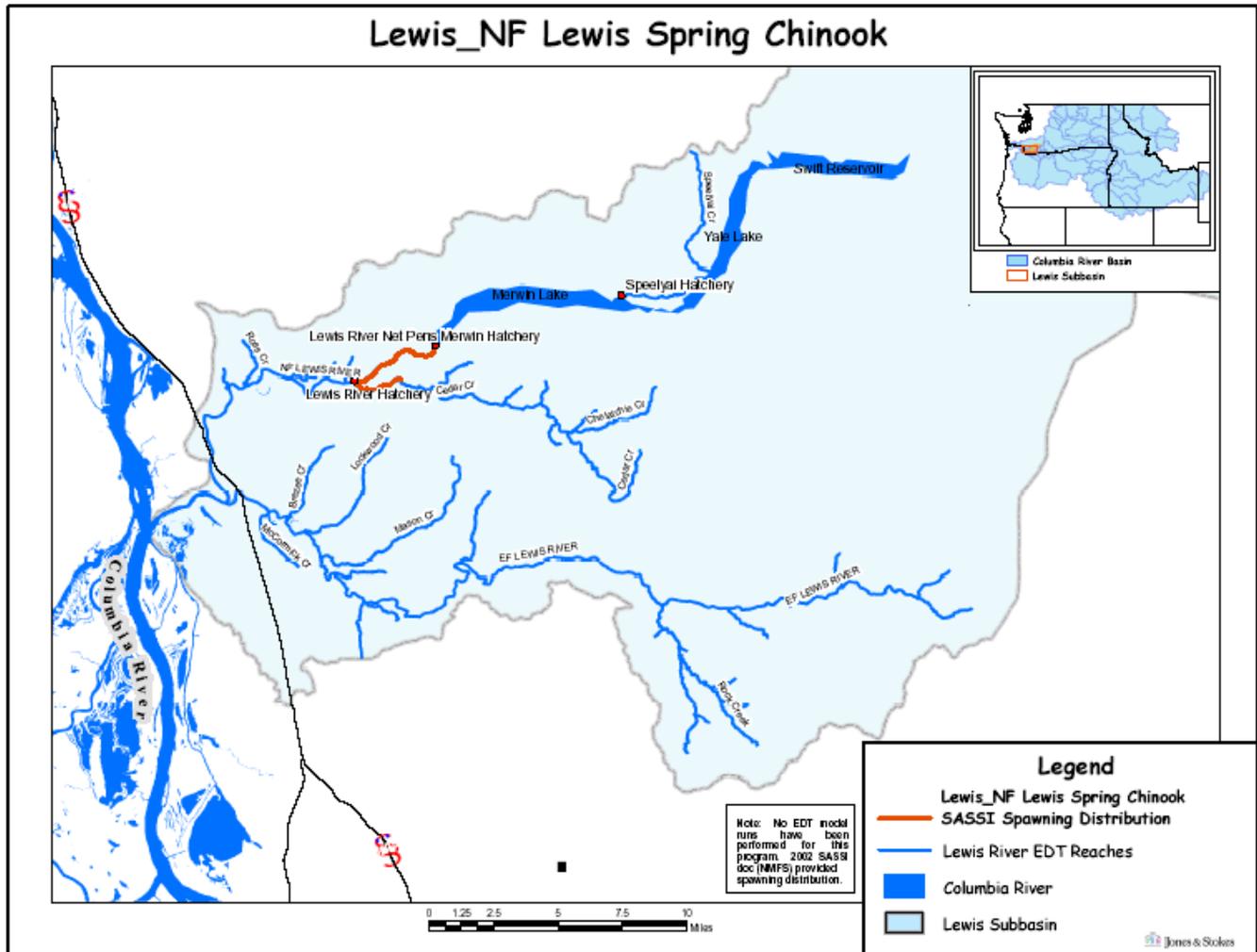
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Kalama Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Harv | - | 0% | 0% | 61% | 0.00 | 154 | 0.5 | 96 | 0 |
| | Seg Harv | 501.3 | 80% | | | | | | 1,606 | 772 |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 41 | 1.1 | 25 | - |
| HSRG Solution | None | - | 95% | 0% | 49% | 0.00 | 68 | 0.5 | 42 | 0 |
| | Seg Harv | 501.3 | 95% | | | | | | 1,606 | 973 |
| HSRG Solution w/ Improved Habitat | Int Harv | - | 95% | 0% | 45% | 0.00 | 80 | 0.6 | 50 | 0 |
| | Seg Harv | 501.3 | 95% | | | | | | 1,606 | 973 |

Hatchery Scientific Review Group Review and Recommendations

Lewis River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Lewis River Spring Chinook

Historically, Lewis River spring Chinook spawned throughout the upper watershed, but with the construction of Merwin Dam at RM 19.2, the majority of the spawning grounds became inaccessible. Today, natural spawning is observed in the East Fork Lewis River. Spawning generally occurs from late August through early October. Lewis spring Chinook are genetically similar to, but distinct from, Kalama Hatchery and Cowlitz Hatchery spring Chinook stocks and all other Columbia River spring Chinook stocks (WDF and WDW 1993) (SaSSI 2002).

This is a mixed stock with composite production. The native component of the stock may have been extirpated or largely replaced by introduced hatchery stocks (Myers 2002). The hatchery component has received more out-of-basin introductions than the Cowlitz or Kalama hatchery spring Chinook broodstocks. The Lewis River Hatchery broodstock was originally taken from Cowlitz and Carson National Fish Hatchery stocks in the 1970s. Since then, this stock has been propagated largely from returns to the hatchery; however, eggs and adults have been brought in from Kalama and Willamette (Oregon) hatchery stocks. The present naturally-spawning spring Chinook population in the Lewis River is composed primarily of hatchery strays (SaSSI 2002).

2 Current Conditions

2.1 Current Population Status and Goals

- **ESA Status:** This population is listed as threatened and is part of the Lower Columbia Chinook ESU.
- **Population Description:** The population is one of the nine spring Chinook populations in the ESU and is designated as a primary population (LCSR&SP 2004). The native component of the stock may have been extirpated or largely replaced by introduced hatchery stocks. The present natural spawning spring Chinook population in the Lewis River is composed primarily of hatchery strays. A program is being developed to use this stock for reintroduction into the upper watershed once passage is provided at the North Fork Lewis River hydroelectric projects.
- **Current Viability Rating:** Low-, with a goal to achieve a High rating.
- **Recovery Goal for Abundance:** 2,200 naturally spawning fish.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity (from EDT):** Productivity 4.7; Capacity 2,069.

2.2 Current Hatchery Programs Affecting this Population

The program currently releases approximately 1.33 million yearlings, including 150,000 fish released from the Fish First Echo Cove net pens (RM 10). Approximately 910 broodstock are needed to support this in-river release program. This stock is also currently used to support a select area fishery program in the Columbia River estuary using fish released from the Deep River net pens, providing 200,000 eggs for this program.

The Lewis River hatchery broodstock was originally taken from Cowlitz and Carson hatchery stocks in the 1970s. Since then, this stock has been propagated largely from returns to the hatchery; however, eggs and adults have been brought in from Kalama and Willamette (Oregon) hatchery stocks.

Hatchery operations:

- Uses single family pairing.
- Incorporates jacks into the broodstock at a rate less than 2%.

Smolt to adult survival for the hatchery program has averaged 0.38% for brood years 1988 through 1999. Contribution to fisheries has been relatively low, with total catch from the program averaging less than 1,000 fish for return years 1992 through 2001.

The current hatchery program is described as an integrated harvest program. However, since no natural-origin fish are included in the hatchery broodstock, the current proportionate natural influence (PNI) is zero. The current estimate of the proportion of hatchery-origin spawners (pHOS) in the total spawning population is approximately 36%. Accounting for the current habitat productivity, harvest and operation of the current hatchery program, the adjusted productivity for the population is estimated to be 1.45 recruits/spawner. The projected average natural-origin escapement under the current condition is 543 fish. The average harvest contribution from the current program is estimated to be 3,100 fish annually. Hatchery returns are projected to exceed broodstock needs by approximately 480 fish annually.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 367 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 1.5 to 2.9. Average abundance of natural-origin spawners (NOS) would increase from 544 to 924. Harvest contribution of the natural and hatchery populations would go from 3,156 to 573.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

There is an adult reintroduction program under way using fish that are uniquely marked. The goal is to establish a Primary population, although the limitations are unknown. The HSRG modeled population conditions that assume reintroduction has been successful; however, it is uncertain what will sustain this population in the long term. Habitat is not limiting. Currently surplus adults and some fingerlings are placed in the upper basin (a segregated program). Downstream juvenile collection facilities have not yet been constructed. The lower basin is managed as a segregated harvest program. It will be critical to remove hatchery fish from the upper basin in order to sustain reintroduction.

Assuming reintroduction efforts are successful and selective harvest can be implemented, the Lewis River spring Chinook population can make a contribution to the recovery of the listed ESU even in the short term, sustaining a natural spawning population and supporting an integrated hatchery program for harvest consistent with primary population objectives.

Recommendations

Continue the current segregated program in the lower river and ongoing planned reintroduction of spring Chinook in the upper river.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

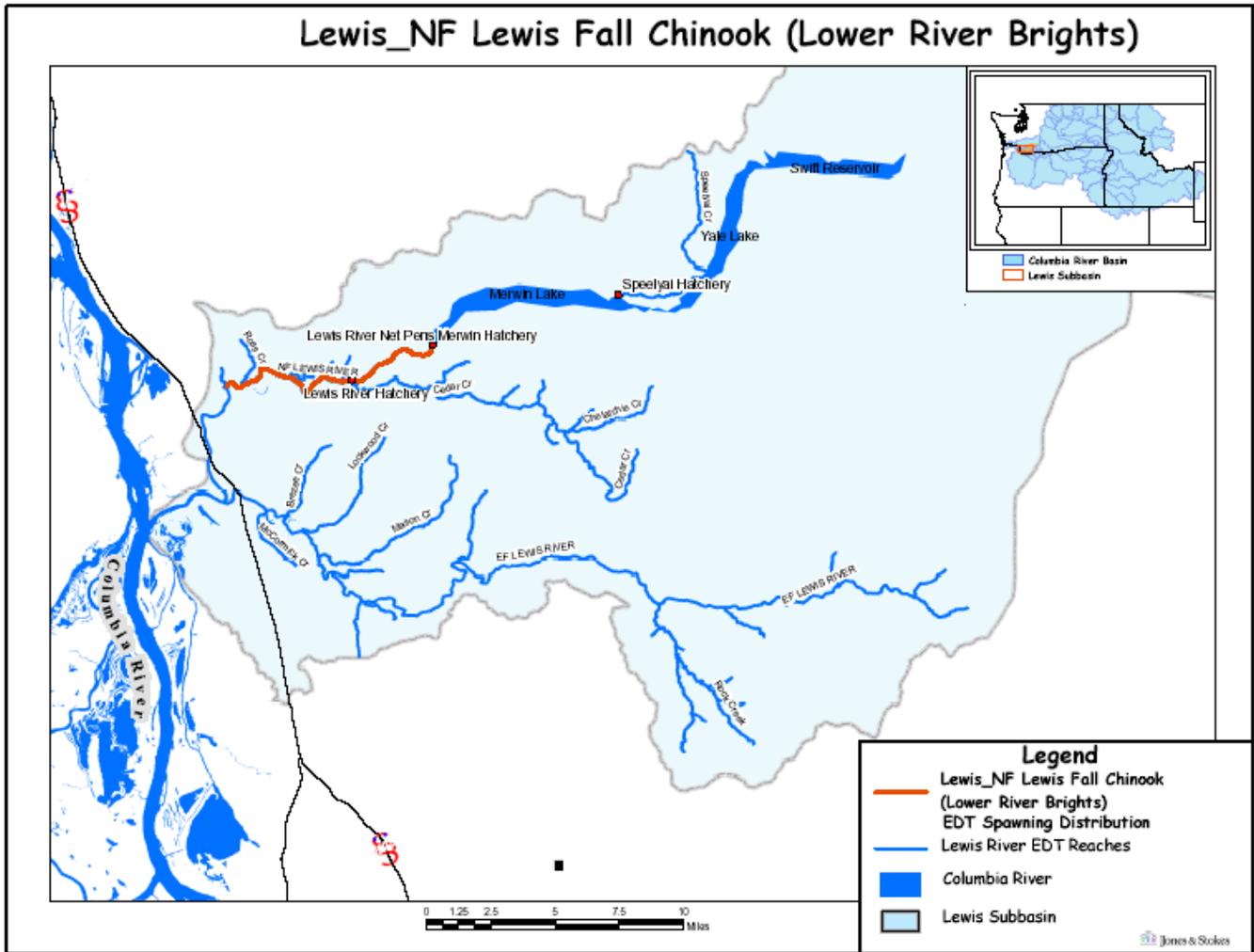
Table 1. Results of HSRG analysis of current condition and HSRG Solution for North Fork Lewis Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 35% | 0.00 | 544 | 1.5 | 337 | 0 |
| | Seg Harv | 1,351.4 | 80% | | | | | | 2,819 | 488 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 924 | 2.9 | 573 | - |
| HSRG Solution | None None | - | 95% | 0% | 21% | 0.00 | 457 | 1.5 | 283 | 0 |
| | Seg Harv | 1,188.0 | 90% | | | | | | 2,479 | 666 |
| HSRG Solution w/ Improved Habitat | None None | - | 95% | 0% | 19% | 0.00 | 539 | 1.6 | 334 | 0 |
| | Seg Harv | 1,188.0 | 90% | | | | | | 2,479 | 559 |

Hatchery Scientific Review Group Review and Recommendations

North Fork Lewis Fall Chinook (Lower River Brights) Population and Related Hatchery Programs

January 31, 2009



1 North Fork Lewis Fall Chinook (Lower River Brights)

Lewis fall Chinook were identified as a stock based on their distinct spawning distribution, late spawning timing and appearance. This stock is a bright fall Chinook stock. Stock status was rated Healthy in 2002, because escapements have exceeded the goal of 5,700 adults in every year since 1986 except 1999 (SaSSI 2002).

Natural spawning over the last 10 years has ranged from about 5,300 to 19,000 adults. Escapement estimates are based on peak fish counts, which are used as an index to estimate total spawners. The majority of the spawning takes place within the 4-mile stretch between the Lewis River Hatchery and Merwin Dam, in addition to Cedar Creek. Surveys are also conducted in the East Fork Lewis River within the 4.2-mile stretch from the area of Lewisville Park to Daybreak Park (HGMP 2004).

Allozyme analysis of natural Chinook spawners sampled in the North Fork Lewis in 1990 showed that they are genetically distinct from other Columbia Basin fall Chinook except East Fork Lewis fall Chinook and Washougal fall Chinook (Marshall et al. 1995).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Threatened
- Population Description: This is a Primary population.
- Recovery Goal for Abundance: 7,300 fish
- Productivity Improvement Expectation: None
- Habitat Productivity and Capacity (e.g., from EDT): Productivity: 18.74; Capacity: 21,049
- Populations Affected by this Hatchery Population Include: None identified.

2.2 Current Hatchery Programs Affecting this Population

There is no fall chinook hatchery in the Lewis River basin.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 110 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For

integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 8.0 to 8.4. Average abundance of natural-origin spawners (NOS) would increase from 8,949 to 9,304. Harvest contribution of the natural and hatchery populations would go from 10,886 to 11,318.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated a Primary population that appears to be productive and abundant, meeting standards for a Primary population.

Recommendations

The HSRG recommends that managers monitor the contribution of hatchery strays to spawning escapement.

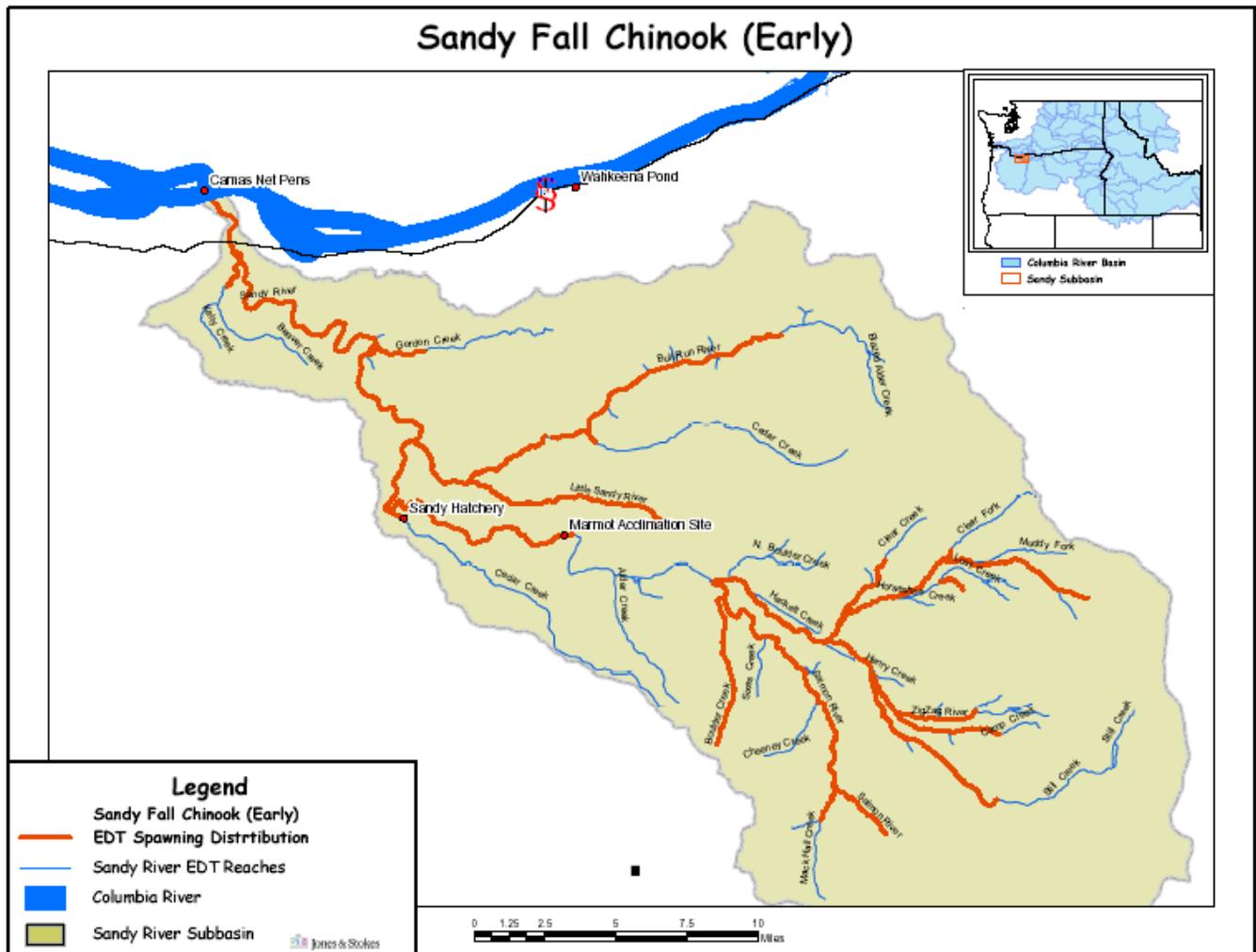
Table 1. Results of HSRG analysis of current condition and HSRG Solution for North Fork Lewis Fall Chinook (Lower River Brights). The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|--------------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 8,949 | 8.0 | 10,886 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 9,304 | 8.4 | 11,318 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 9,113 | 8.2 | 11,086 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 10,182 | 9.0 | 12,386 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Sandy Fall Chinook (Early) Population and Related Hatchery Programs

January 31, 2009



1 Sandy Fall Chinook (Early)

The fall Chinook in the Sandy River are part of the Lower Columbia River Chinook Evolutionarily Significant Unit (ESU), which is listed as threatened under the Endangered Species Act (ESA). It is designated as a Stabilizing population.

Fall Chinook (tule) in the Sandy return in late August and generally spawn by October. Most of the spawning habitat is found in the mainstem Sandy, Bull Run, and Little Sandy Rivers. Little abundance data is available on the Sandy River tule fall Chinook population. There is no abundance or productivity evidence supporting the existence of a viable natural-origin population in the Sandy River, and comparisons with populations in similar habitats suggest the population is at significant risk. Historical fall Chinook production areas were limited to the lower mainstem and portions of the mainstem tributaries. Most of the core production area remains accessible. Portions of the historical distribution in the Bull Run River are blocked by a dam. Habitat quality remains adequate to support spawning throughout a significant portion of the accessible range. Habitat changes in the Columbia mainstem and estuary would likely have a significant effect on fall Chinook salmon and contribute to changes in the spatial structure of the population. This population is believed to be significantly affected by hatchery-origin fish from lower Gorge production facilities (Draft Oregon Lower Columbia Recovery Plan 2007).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Sandy fall Chinook (early) population.

- ESA Status: The wild population of fall Chinook in the Sandy River is listed as threatened and is part of the Lower Columbia River Chinook ESU.
- Population Description: The Sandy River fall Chinook (early) is a Stabilizing population.
- Recovery Goal for Abundance: Unknown.
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity (from EDT): Productivity: 5.26; Capacity: 7,647.

2.2 Current Hatchery Programs Affecting this Population

No fall Chinook hatchery program currently operates in the Sandy River; however, fall Chinook salmon from other programs stray into the basin. About 90 adult fall Chinook are estimated to stray into this system annually. Under the current scenario, pHOS is estimated at approximately 4%, even though no hatchery fall Chinook are released in the Sandy River. Annually, approximately 1,600 natural-origin adults are estimated to return to the Sandy River.

Estimated number of hatchery strays affecting this population:

Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 90 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 1.8 to 2.6. Average abundance of natural-origin spawners (NOS) would increase from approximately 1,607 fish to approximately 2,569 fish. Harvest contribution of the natural and hatchery populations would also go from approximately 1,578 fish to approximately 2,524 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

No hatchery program for fall Chinook is operated in the basin. This population is designated a Stabilizing population, but might warrant an upgrade to Contributing status.

Recommendations

The HSRG recommends that managers monitor the contribution of hatchery strays to spawning escapement.

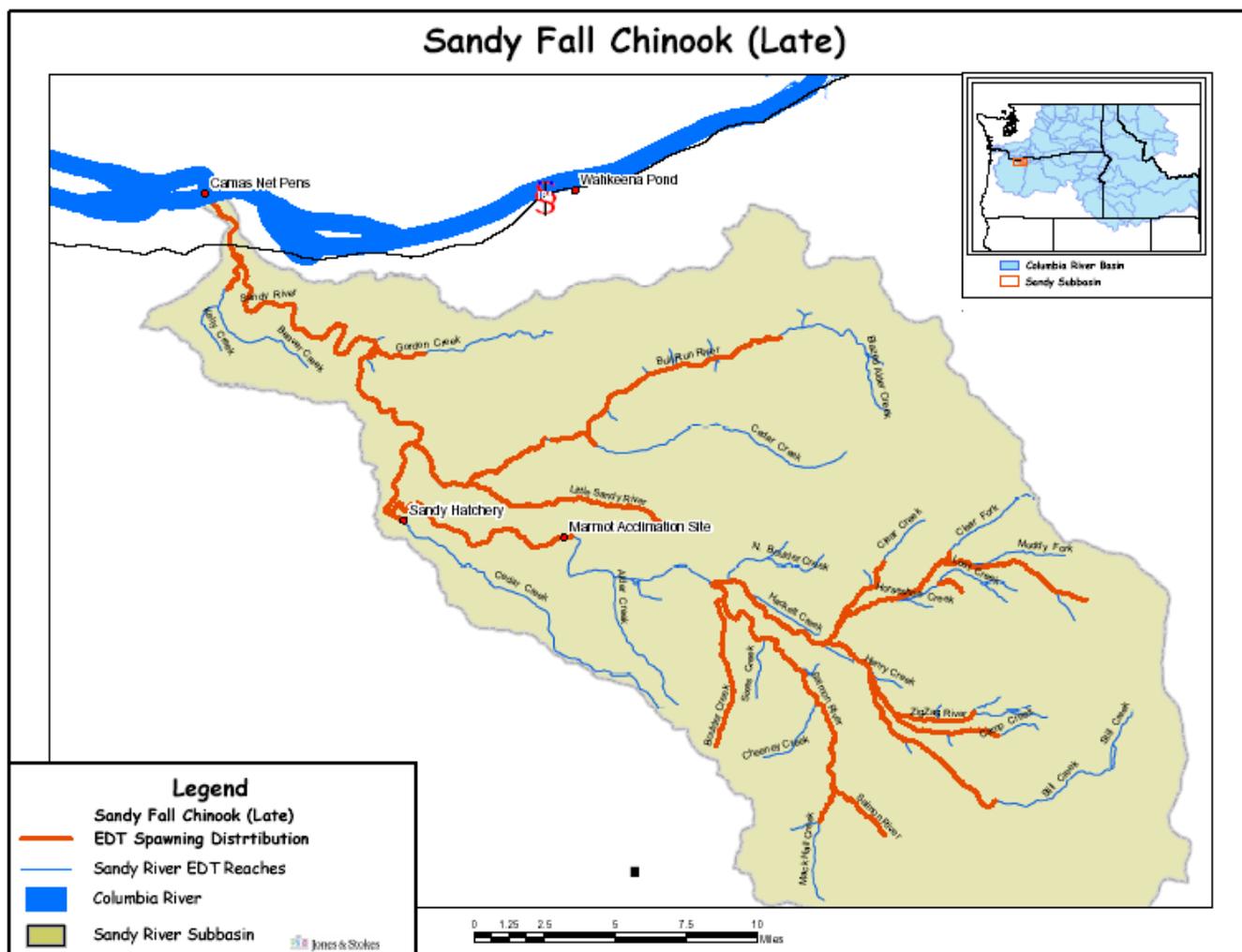
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Sandy Fall Chinook (Early). The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 4% | 0.00 | 1,607 | 1.8 | 1,578 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 2,569 | 2.6 | 2,524 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 3,866 | 3.3 | 1,784 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 4,469 | 3.7 | 2,062 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Sandy Fall Chinook (Late) Population and Related Hatchery Programs

January 31, 2009



1 Sandy Fall Chinook (Late)

The fall Chinook (late fall brights) in the Sandy River are part of the Lower Columbia River Chinook Evolutionarily Significant Unit (ESU), which is listed as threatened under the Endangered Species Act (ESA). It is designated as a Primary population.

Fall Chinook (late fall brights) in the Sandy return in September and October and spawn through January, mainly in the mainstem of the Sandy River. The population is relatively large (recent geometric mean > 2,500 spawners) and relatively free of hatchery fish. Historical fall Chinook production areas were limited to the lower mainstem and portions of the mainstem tributaries. Most of the core production area remains accessible. Portions of the historical distribution in the Bull Run River are blocked by a dam. Habitat quality remains adequate to support spawning throughout a significant portion of the accessible range. Habitat changes in the Columbia mainstem and estuary likely have a significant effect on fall Chinook salmon and contribute to changes to the spatial structure of the population. Annual variation has resulted in low periodic effective population sizes and this isolated population is not supported by any degree of metapopulation dynamics with other associated populations.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Sandy fall Chinook (late) population.

- ESA Status: The wild population of fall Chinook in the Sandy River is listed as threatened and is part of the Lower Columbia River Chinook ESU.
- Population Description: The Sandy River fall Chinook (late) is a Primary population.
- Recovery Goal for Abundance: Unknown.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (from EDT): Productivity: 5.0; Capacity: 7,097.

2.2 Current Hatchery Programs Affecting this Population

No fall Chinook (bright) hatchery program currently operates in the Sandy River; however, fall Chinook (bright) salmon from other programs stray into the basin. About 40 adult fall Chinook are estimated to stray into this system annually. Under the current scenario, pHOS is estimated at only 1% from out-of-basin hatchery strays. Annually, approximately 2,200 natural-origin adults are estimated to return to the Sandy River.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For

integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 2.4 to 2.7. Average abundance of natural-origin spawners (NOS) would increase from approximately 2,338 fish to approximately 2,610 fish. Harvest contribution of the natural and hatchery populations would go from approximately 2,043 fish to approximately 2,281 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

No hatchery program for fall Chinook (bright) is operated in the basin. This population is designated a Primary population that appears to be productive and abundant.

Recommendations

The HSRG recommends that managers monitor the contribution of hatchery strays to spawning escapement.

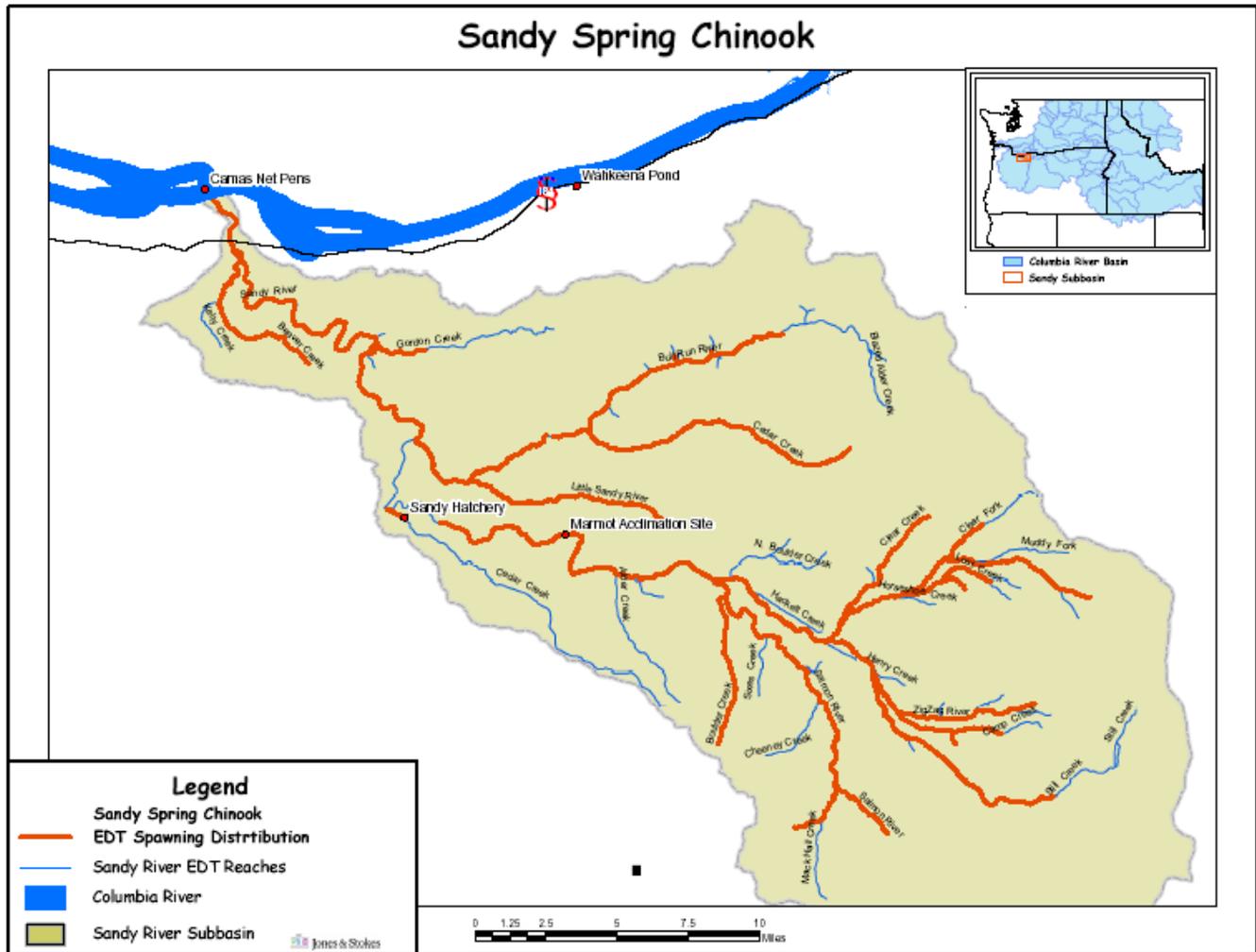
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Sandy Fall Chinook (Late). The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 2,338 | 2.4 | 2,043 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 2,610 | 2.7 | 2,281 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 2,338 | 2.4 | 2,043 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 2,807 | 2.7 | 2,452 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Sandy Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Sandy Spring Chinook

The spring Chinook in the Sandy River are part of the Lower Columbia River Chinook Evolutionarily Significant Unit (ESU), which is listed as threatened under the Endangered Species Act (ESA). It is designated as a Primary population.

This hatchery program has recently transitioned to a native-type (integrated) broodstock program. Prior to brood year 2002, all hatchery releases of spring Chinook into the Sandy River were of Clackamas River origin. Native Sandy River spring Chinook were first collected as broodstock for this program in 2002. The first release of hatchery smolts from local natural-origin broodstock was in the spring of 2004. After the broodstock conversion to the localized stock was completed in 2007, 30% of the broodstock will now consist of wild fish.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Sandy Spring Chinook population.

- **ESA Status:** The wild population of spring Chinook in the Sandy River is listed as threatened and is part of the Lower Columbia River Chinook ESU.
- **Population Description:** The Sandy River spring Chinook is a Primary population.
- **Recovery Goal for Abundance:** The TRT current abundance estimate is 2,600, while the ODFW abundance estimate is 1,800 to 2,000 for the natural population.
- **Productivity Improvement Expectation:** No information was provided about the expected change in productivity from implementation of habitat recovery plans and other recovery measures.
- **Habitat Productivity and Capacity:** Habitat productivity and capacity values were provided by ODFW (Chilcote); EDT values also were available from the City of Portland (Kucas). This analysis is based on the estimates from ODFW: Productivity 4.801, and Capacity 2,549¹.

Populations Affected by this Hatchery Population Include:

ESA-listed populations that may be directly affected by the program:

- **Lower Columbia River Chinook:** The Lower Columbia River Chinook salmon ESU includes all naturally spawned Chinook populations residing below impassable natural barriers (e.g., long-standing natural waterfalls) from the mouth of the Columbia River to the crest of the Cascade Range just east of the Hood River in Oregon and the White Salmon River in Washington. This ESU excludes populations above Willamette Falls, as well as Clackamas River spring Chinook. Within this ESU, there are historic runs of three different Chinook populations: spring-run, tule, and late-fall bright Chinook salmon. The Sandy River contains listed spring-run and late-fall bright Chinook.

ESA-listed populations that may be incidentally affected by the program:

- All listed species occupying habitats in the lower Sandy River and the lower Columbia River migration corridor(s) may be affected by the presence of Sandy River (hatchery) spring

¹ The corresponding DT values are 4.2 and 7,695.

Chinook. While the potential exists for negative impacts, no direct effect has yet been quantified regarding which, if any, of these populations are affected, and in what way. However, it is believed that any incidental impact to listed species is minimal, based upon risk aversion measures of the hatchery program identified in this HGMP. These listed species include:

- Columbia River Bull Trout: The USFWS issued a final rule listing the Columbia River population of bull trout as a threatened species on June 10, 1998. The Hood River Recovery Unit forms part of the range of the Columbia River population and encompasses the Sandy River subbasin.
- Lower Columbia River Steelhead: The Lower Columbia River steelhead ESU was listed as threatened under the ESA on March 19, 1998. This ESU contains tributaries to the Columbia River between the Cowlitz and Wind rivers in Washington, inclusive, and the Willamette and Hood rivers in Oregon, inclusive. Excluded are steelhead in the upper Willamette River Basin above Willamette Falls and steelhead from the Little and Big White Salmon rivers in Washington.
- Lower Columbia River Chum: The Lower Columbia River chum salmon were listed as a threatened species on March 25, 1999. The ESU includes all naturally spawning populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon.
- Lower Columbia River Coho: Lower Columbia River coho are listed as endangered by the State of Oregon and threatened by NOAA Fisheries.

2.2 Current Hatchery Programs Affecting this Population

Under the current program, a total of 200 adults are collected to meet the smolt production goal of 300,000. This number allows for an adult mortality of approximately 30 adults, and is expected to yield a maximum total of 300,000 smolts for release (300,000 is the target release number). Wild Sandy River adults are collected beginning in May, mature over the summer and are spawned from mid-September through mid-October. Adults are collected at the Sandy River Hatchery and at Marmot Dam. Collection sites for spring Chinook broodstock are currently being developed in upper Sandy Basin (e.g. Salmon River, Still Creek). Staff will utilize angler caught fish, traps, and seines to collect the wild component of the broodstock in the future. They are transferred to the Clackamas Hatchery for holding and spawning. Eggs are incubated at the Clackamas Hatchery and transferred as eyed eggs to the Willamette Hatchery. Fingerlings are transferred to Marion Forks Hatchery for rearing from April through October. Then the fish are transferred to Clackamas Hatchery for final rearing from October to February. The fish are acclimated for 3 or 4 weeks at Sandy Hatchery before direct release at the hatchery into Cedar Creek. Smolts are released in March at about 9 fish per pound.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 162 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 113 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning

population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 3.9 to 4.0. Average abundance of natural-origin spawners (NOS) would increase from approximately 1,550 fish to approximately 1,776 fish. Harvest contribution of the natural and hatchery populations would go from approximately 633 fish to approximately 317 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The current integrated Sandy spring Chinook hatchery program (300,000 smolts released; 100% pNOB; pHOS = 12%) is consistent with the Primary population designation.

The HSRG has concerns with the potential for pathogen transfer (and stress) associated with the practice of incubating and rearing the fish outside the Sandy River subbasin.

Removal of Marmot Dam in 2008 will eliminate existing opportunities for collecting natural broodstock and monitoring spawning composition.

Recommendations

Maintain the existing program and develop alternate strategies for managing broodstock and spawning composition after removal of Marmot Dam. We also recommend that risks associated with rearing fish outside of the basin be addressed.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

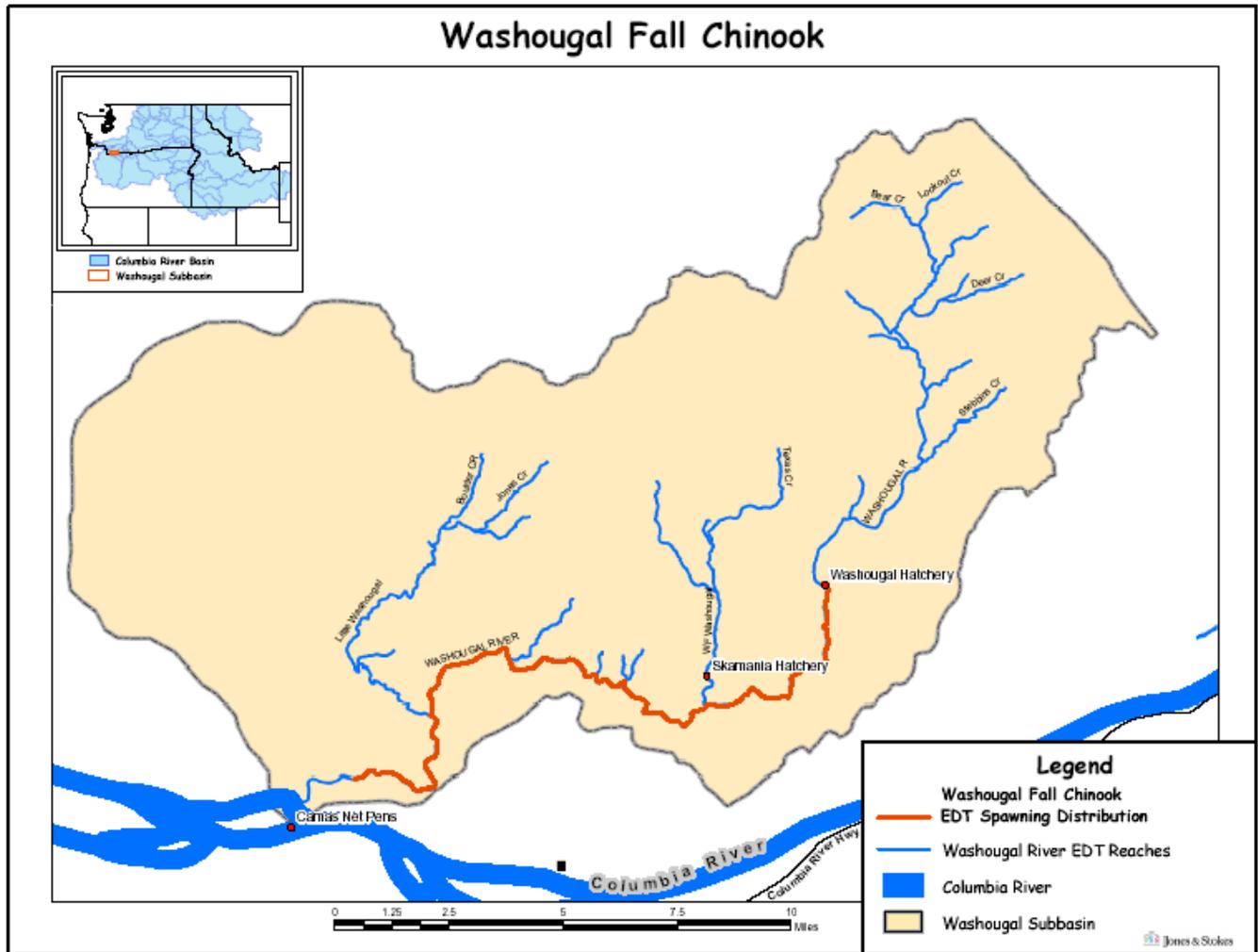
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Sandy Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Harv | 300.5 | 90% | 0% | 12% | 0.89 | 1,550 | 3.9 | 633 | 1,464 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,776 | 4.0 | 317 | - |
| HSRG Solution | Int Harv | 300.7 | 90% | 20% | 6% | 0.75 | 1,515 | 3.4 | 1,491 | 624 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Harv | 300.7 | 90% | 20% | 6% | 0.78 | 1,753 | 3.9 | 1,548 | 624 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Washougal Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Washougal Fall Chinook

The Washougal River fall Chinook natural spawners are a mixed stock of composite production. Natural spawning does occur, but these fish are identified as hatchery strays. Washougal River fall Chinook spawn in the area from Salmon Falls (RM 14.5) downstream approximately 4.0 miles. Natural spawning occurs in the Washougal River slightly later (October to November) than other lower Columbia River tule fall chinook stocks. Natural escapement is estimated using spawning ground counts within selected index areas. Natural spawn escapements from 1967-1991 averaged 1,832 with a low return of 70 in 1969 and a peak return of 4,578 in 1989. Since 1971, the annual natural escapement has averaged 2,157 fish. SaSSI (2002) listed the Washougal River fall Chinook natural spawn stock status as healthy, based on escapement trend. Although final escapement objectives have not been established by the NMFS through a recovery plan, WDFW (2003) has established interim minimum escapement objectives. The minimum fall Chinook MSY escapement goal is 3,000 adult spawners from the mouth of the Washougal River to the Washougal Salmon Hatchery (HGMP 2004).

2 Current Conditions

2.1 Current Population Status and Goals

The Washougal fall Chinook population is included in the Lower Columbia ESU. Fall Chinook are native to the Washougal River, but substantial numbers of hatchery Chinook have been released into this watershed from the Grays, Elochoman, Toutle, Kalama, and Bonneville (Oregon) hatcheries. This population may, therefore, be a mixture of native and hatchery fish.

- ESA Status: This population is listed as threatened.
- Population Description: The Washougal fall Chinook population is designated as Primary (LCSR&SP 2004).
- Current Viability Rating: Low.
- Recovery Goal for Abundance: 5,800 natural spawning fish.
- Productivity Improvement Expectation: The recovery plan provides for productivity improvement and habitat capacity expectations of 4.3 R/S and 2,544 fish, respectively.
- Habitat Productivity and Capacity (from EDT): Productivity 3.84; Capacity 2,271.
- Populations Affected by this Hatchery Population: Through straying and other interactions, this hatchery population has the potential to affect native populations in the Coastal and Cascade components of the Lower Columbia Chinook Salmon ESU.
- Hatchery Populations of the Same Species that Affect this Population: Tule fall Chinook programs operating in the Elochoman, Cowlitz, and Kalama rivers in Washington, as well as the Big Creek program in Oregon, have the potential to produce strays that could enter the Washougal River and affect the local population. Spring Creek National Fish Hatchery and Bonneville Fish Hatchery Tule fall Chinook releases have the potential to affect this population/program, as well.

2.2 Current Hatchery Programs Affecting this Population

- Projected pHOS Estimates (includes strays from all hatchery programs): 57%. The current number of stray fall Chinook in the Washougal River is estimated at 947.

- Estimated Adjusted Productivity (with harvest and with fitness factor effects from AHA): 0.96.
- Projected Average Natural-Origin Escapement: 567 fish

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 853 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observation and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 1.0 to 2.0. Average abundance of natural-origin spawners (NOS) would increase from 578 to 693. Harvest contribution of the natural and hatchery populations would go from 7,368 to 694.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is a Primary population intended to be managed as an integrated harvest program (4.0 million). This program produces a high proportion of the naturally spawning population. WDFW is proposing to construct a weir at RM 3.0 to address the stray issue.

Recommendations

This Primary population is important to the ESU. The HSRG suggests a stepping-stone approach for the hatchery. The integrated program would release 650,000 fish (adipose-clipped and tagged). The segregated component would release 920,000 fish (adipose-clipped and a portion tagged). The HSRG identified surplus from this program that could provide a source for a segregated, harvest program of 2.1 million fish to be released from net pens in the Columbia estuary (see Youngs Bay Fall Chinook report for details). This approach would increase harvest and achieve natural population objectives. Facility provisions need to be evaluated to accommodate a stepping-stone program. In addition, a lower river weir is needed to manage composition on the spawning grounds consistent with the standards of a Primary population.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

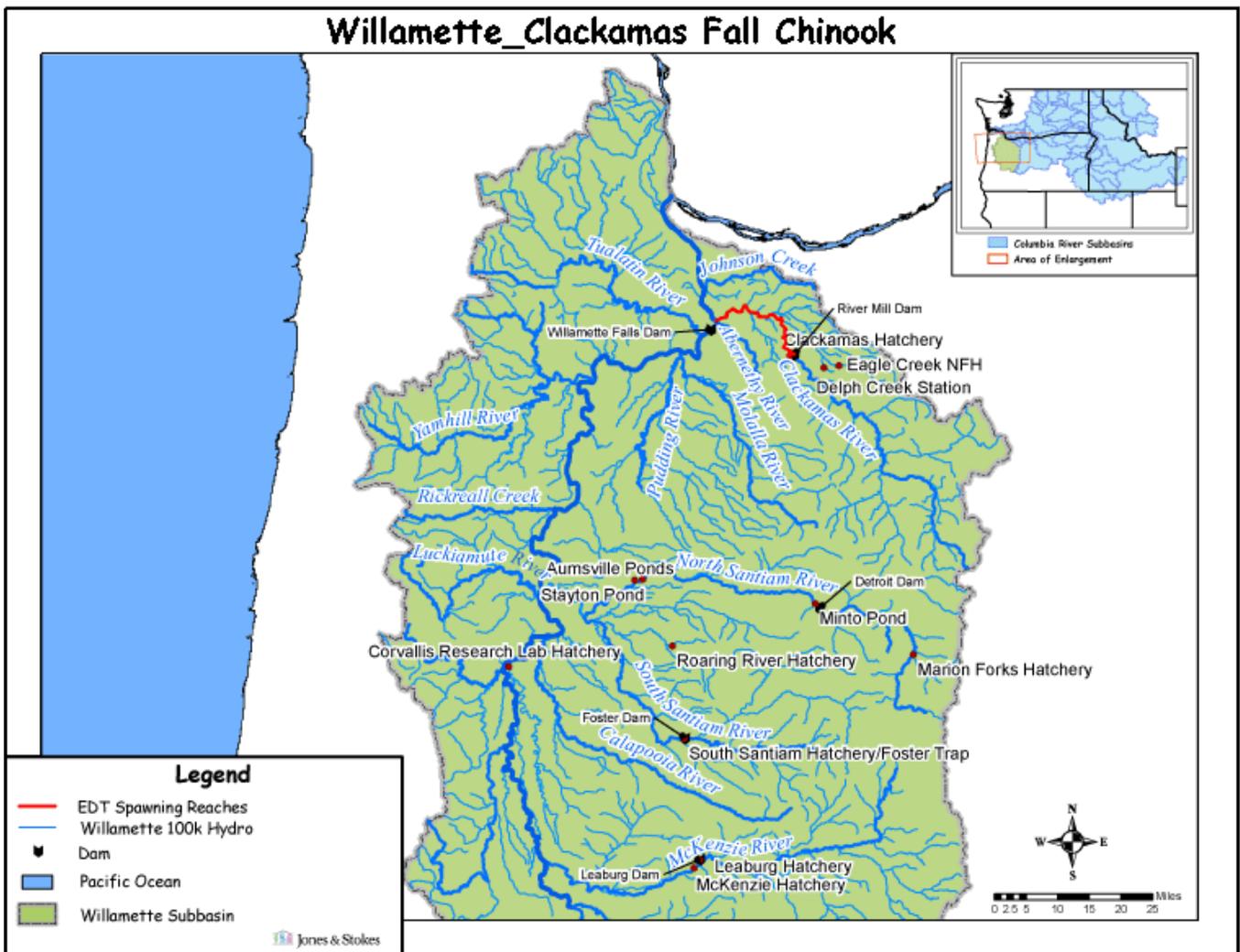
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Washougal Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-------------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 54% | 0.00 | 578 | 1.0 | 579 | 0 |
| | Seg Harv | 4,002.6 | 86% | | | | | | 6,789 | 3,863 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 693 | 2.0 | 694 | - |
| HSRG Solution | Int Harv | 1,123.2 | 92% | 95% | 1% | 0.88 | 1,070 | 2.7 | 2,588 | 468 |
| | Stepping Stone Seg Harv | 919.0 | 90% | | | | | | 1,356 | 1,582 |
| HSRG Solution w/ Improved Habitat | Int Harv | 1,123.2 | 92% | 95% | 1% | 0.90 | 1,276 | 2.9 | 2,686 | 1,252 |
| | Stepping Stone Seg Harv | 919.0 | 90% | | | | | | 1,356 | 1,582 |

Hatchery Scientific Review Group Review and Recommendations

Willamette – Clackamas Fall Chinook Salmon Population and Related Hatchery Programs

January 31, 2009



1 Clackamas Fall Chinook Salmon

Fall Chinook in the Clackamas River are largely confined to the mainstem below River Mill Dam and the lower reaches of the major tributaries (Deep, Clear and Eagle creeks) in the lower river (personal communication, Doug Cramer, PGE). Historically they probably extended up through the Middle Clackamas reaches. Fall Chinook are native to the Clackamas River; however, the population was extirpated in the mid-1930s because of poor water quality in the lower Willamette. Access to spawning areas was also severely impeded or prevented by the Faraday and River Mill dams from 1906 to 1939. The run was reestablished from lower Columbia River hatchery stocks. Stocking ceased in the early 1980s and the run is now supported by natural production (WLC-TRT 2003; Subbasin Plan).

Fall Chinook are counted by ODFW in the lower Clackamas River. Since the mid-1960s, returns to the Clackamas River have generally declined, varying widely from a high of 1,385 fish in 1974 to a low of 20 fish in 1999. Returns over the period averaged 469 fish (Subbasin Plan). With normal environmental variation and events, it is unlikely that the current habitat can support a sustainable natural population of fall Chinook in the Clackamas River. Based on EDT habitat analysis, the major factor limiting fall Chinook production here is water temperature during the late summer and fall. Fall Chinook spawn in September, a period when water temperatures in the lower Clackamas are high enough to preclude successful spawning until they moderate in October. Sediment, habitat diversity and channel stability were also rated as important limiting factors for fall Chinook in the lower mainstem (Clackamas Subbasin Plan).

The population is part of the lower Columbia River fall Chinook group (Howell et al 1985) and is considered a tule ocean-type life history. Columbia River tule fall Chinook are an important component of commercial harvest off Oregon, Washington, and southern British Columbia. Fall Chinook are released in large numbers from several lower Columbia River hatcheries to support these fisheries, although Clackamas Chinook are natural spawners. Adults enter the river in August with peak returns in September and spawning follows shortly in September and October. Juveniles spend relatively little time in the Clackamas and begin moving downstream toward the estuary during the spring and summer (Subbasin Plan).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Clackamas River fall Chinook are part of the Lower Columbia Chinook ESU, which was listed as threatened under the ESA in 1994.
- **Population Description:** The Clackamas River fall Chinook population is designated as a Contributing population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes current viability as NA with a viability goal of Medium. The W/LC TRT identified this population as a core population (Subbasin Plan).
- **Recovery Goal for Abundance:** The abundance goal is 1,400 and the potential abundance is 2,800.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity (e.g., from EDT):** Productivity: 1.99; Capacity 933.

2.2 Current Hatchery Programs Affecting this Population

No hatchery programs for fall Chinook currently operate in Clackamas River; however, about 70 adult fall Chinook from other programs are estimated to stray into this system annually. Under the current scenario, pHOS is estimated at 53%, even though no hatchery fall Chinook are released in the basin. Annually, approximately 50 natural-origin adults are estimated to return to the Clackamas River.

Estimated number of hatchery strays affecting this population:

Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 71 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.5 to 1.0. Average abundance of natural-origin spawners (NOS) would decrease from approximately 50 fish to approximately 1 fish. Harvest contribution of the natural and hatchery populations would also go from approximately 52 fish to 1 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where

applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager’s goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

There are no hatchery programs for fall Chinook that operate in this basin. Out-of-basin strays are estimated to make up 53% of the natural spawning population. This proportion of hatchery fish on the spawning grounds would only be consistent with a population designation as a Stabilizing population.

Recommendations

The HSRG recommends that this population be managed for natural production as a Stabilizing population.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

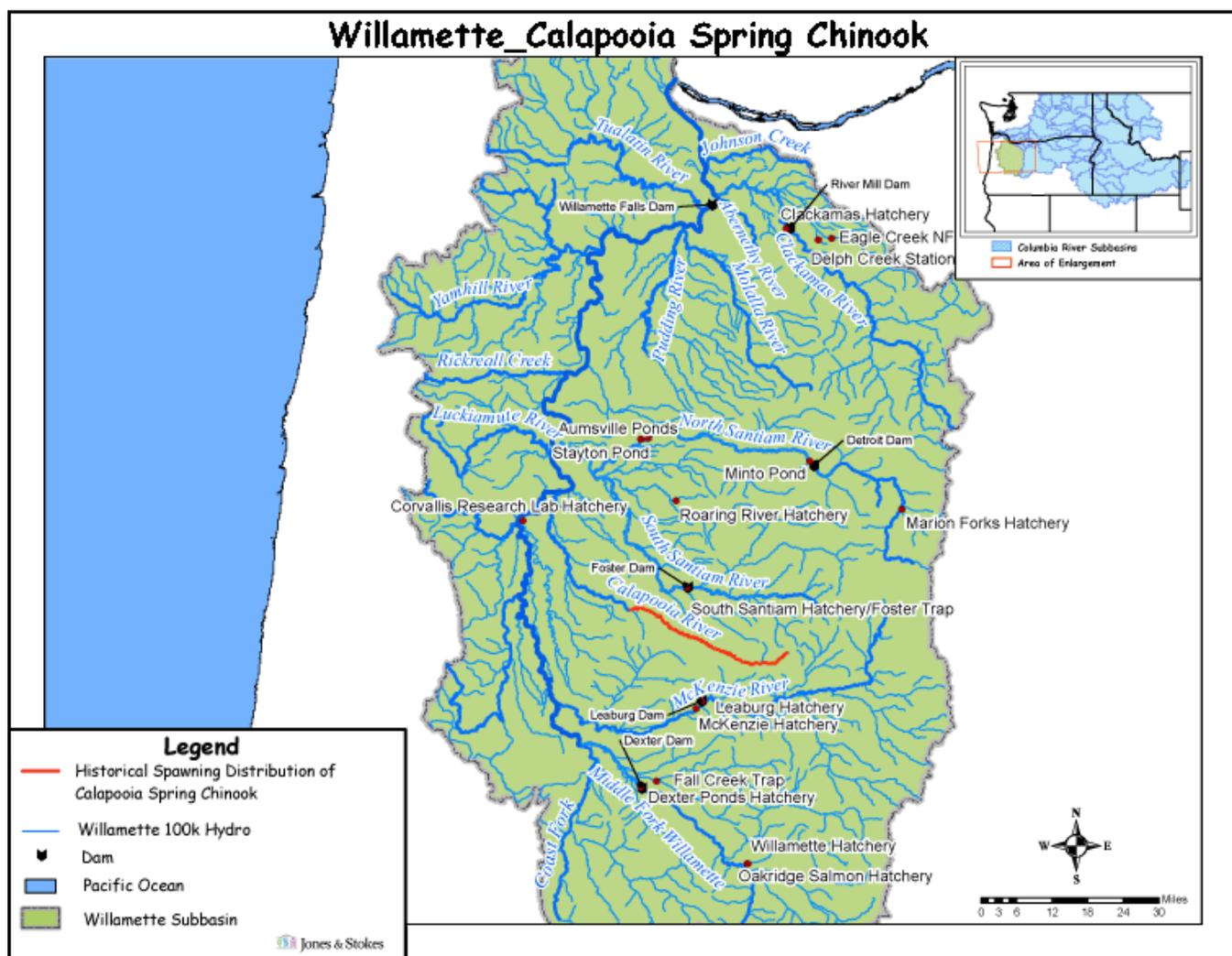
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Clackamas Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | | | | | | | | | |
| | None | - | 0% | 0% | 53% | 0.00 | 50 | 0.5 | 52 | - |
| No Hatchery | None | | | | | | | | | |
| | None | - | 0% | 0% | 0% | 1.00 | 1 | 1.0 | 1 | - |
| HSRG Solution | None | | | | | | | | | |
| | None | - | 0% | 0% | 36% | 0.00 | 64 | 0.7 | 30 | - |
| HSRG Solution w/ Improved Habitat | None | | | | | | | | | |
| | None | - | 0% | 0% | 32% | 0.00 | 78 | 0.7 | 37 | - |

Hatchery Scientific Review Group Review and Recommendations

Willamette – Calapooia Spring Chinook Salmon Population and Related Hatchery Programs

January 31, 2009



1 Calapooia Spring Chinook Salmon

A small run of spring Chinook salmon historically existed in the Calapooia River, comprising one of seven demographically independent populations of spring Chinook salmon in the Upper Willamette River Spring Chinook Salmon ESU (Meyers et al. 2003). Parkhurst et al. (1950) reported that in 1941 the run size was approximately 200 adults, while Mattson (1948) estimated the run at 30 adults in 1947. Today, the Calapooia natural spring Chinook population is believed to be extirpated, or nearly so (Nicholas 1995; Meyers et al. 2003; Subbasin Plan).

Historically, spring Chinook salmon used the river between Holley (RM 45) and just upstream from the confluence with United States Creek (RM 80) for spawning and rearing (Wevers et al. 1992). Today, most of the spring Chinook spawn upriver in the forested portion of the subbasin (RM 45). Parkhurst et al. (1950) estimated suitable habitat for 9,000 fish. In contrast, in the 1960s the estimated run size was only 100 to 500 fish (Willis et al. 1960). Nicholas (1995) considered the Calapooia River run extinct with limited future production potential (Subbasin Plan).

Some sub-yearling spring Chinook have been observed in off-channel areas of the Willamette and the lower reaches of valley floor tributaries. Their movements may be timed to co-occur with (or may be triggered by) fall and early winter freshets which flood habitat that would be unsuitable during summer because of high temperatures and low flow (Kenaston 2003). ODFW has found spring Chinook fingerlings up some valley floor tributaries as far as 20 miles from the mainstem. Juvenile spring Chinook salmon from other upper Willamette populations, including the McKenzie, have been observed during the winter in seasonal streams in the lower Calapooia subbasin (personal communication, Colvin, Oregon State University, 2004; Subbasin Plan).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Calapooia spring Chinook are part of the Upper Willamette River Chinook Salmon ESU, which was listed as threatened under the ESA in March 24, 1999 (64 CFR 14308).
- **Population Description:** The Calapooia spring Chinook population has not been assigned a designation. This population is considered extirpated, or nearly so by TRT, and it was given a Stabilizing designation for the HSRG review.
- **Recovery Goal for Abundance:** Unknown.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity:** Productivity 1.5; Capacity 100.

2.2 Current Hatchery Programs Affecting this Population

Hatchery releases into the Calapooia occurred from 1981 to 2003 from various within-ESU sources (Santiam, Willamette, Dexter Ponds, McKenzie) (Subbasin Plan). In recent years, live adults (ODFW Stock #24) from the South Santiam Hatchery have been outplanted into the Calapooia River. A 2002 survey of 11.1 miles of the Calapooia above Brownsville found 16 redds (Schroeder et al. 2002); in 2003, 2 redds were documented. The carcasses recovered in the

Calapooia in 2002 were too decomposed to determine the presence or absence of fin clips; however, it was assumed that these were hatchery fish outplanted from the South Santiam hatchery (Schroeder et al. 2002; Subbasin Plan). In 2003, about 200 adult hatchery-origin spring Chinook were released into the Calapooia (Schroeder et al. 2003; McElhany et al. 2007 review draft). These hatchery fish are likely responsible for producing the 2 redds observed. Of 48 carcasses surveyed in 2003, 43 (90%) were fin-clipped hatchery fish; the origin of the other 5 fish was unknown, as not all hatchery-origin fish are clearly fin-clipped (Schroeder et al. 2003). A survey of 27 female carcasses in the Calapooia in 2003 found 100% pre-spawning mortality (Schroeder and Kenaston 2004; McElhany et al. 2007 review draft).

Inventory efforts in recent years have shown natural production ranging from very poor (no juveniles observed) to encouraging (294 juveniles per mile observed). Overall, successful natural production potential appears to be low.

As directed by the Calapooia River Basin Management Plan (OAR-500-1666), the Calapooia River will be managed for natural production of spring Chinook. The latest releases of surplus hatchery-origin adults occurred in 2003, but hatchery Chinook may be used again if necessary to enhance natural production to a sustainable level.

No hatchery program for spring Chinook currently operates in the basin; however, about 31 adult spring Chinook from other programs are estimated to stray into this system annually. Under the current scenario, pHOS is estimated at 55%, even though no hatchery spring Chinook are released in the Calapooia River. Annually, approximately 20 natural-origin adults are estimated to return to Gnat Creek.

Estimated number of hatchery strays affecting this population:

Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 31 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence PNI value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.2. Average abundance of natural-origin spawners (NOS) would increase from approximately 10 fish to approximately 14 fish. Harvest contribution of the natural and hatchery populations would remain unchanged at three fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

There are no hatchery programs for spring Chinook that operate in this basin. Out-of-basin strays are estimated to make up 55% of the natural spawning population. This proportion of hatchery fish on the spawning grounds would only be consistent with designation as a Stabilizing population.

Recommendations

The HSRG recommends that this population be managed for natural production as a Stabilizing population.

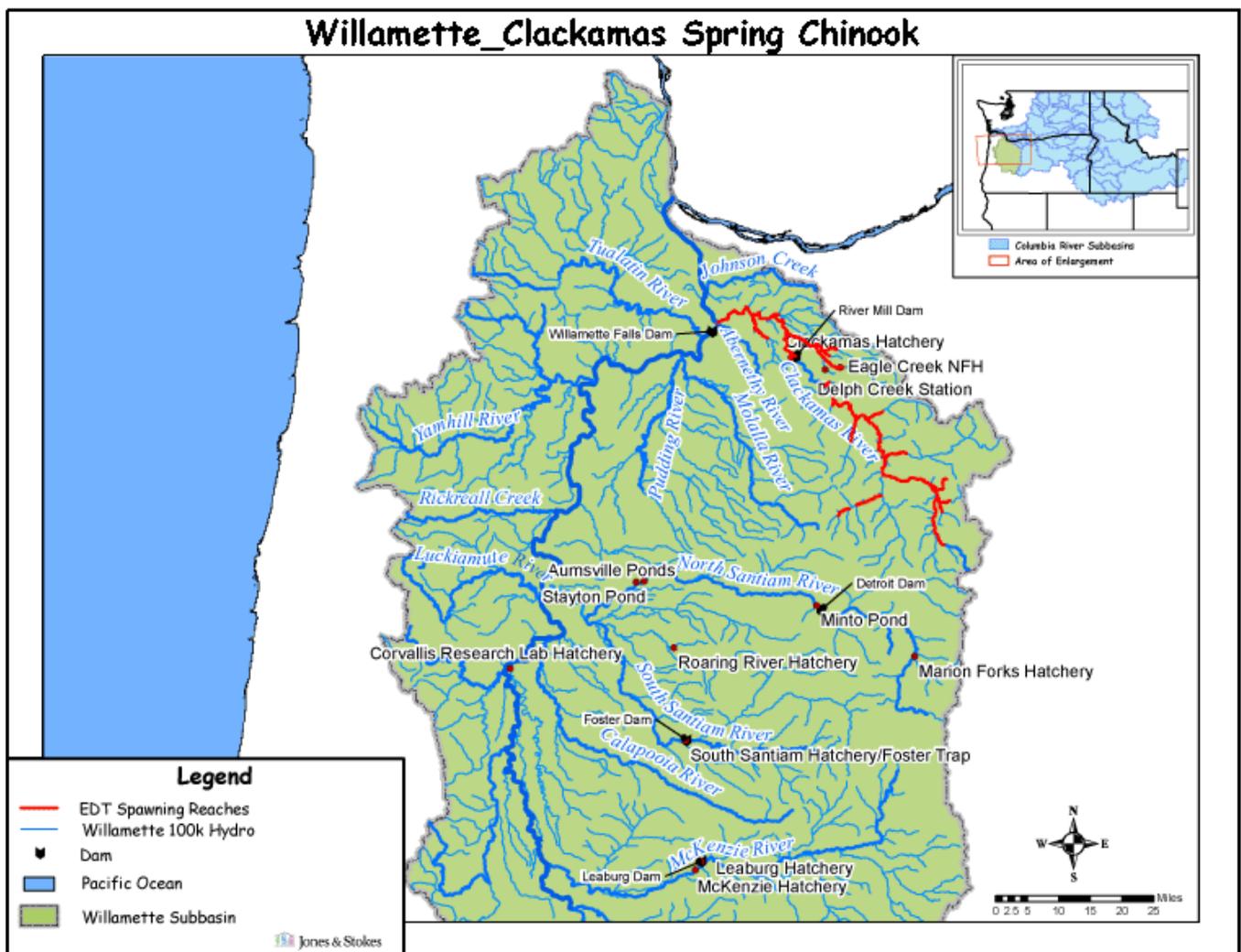
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Calapooia Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|--------------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 44% | 0.00 | 10 | 0.6 | 3 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 14 | 1.2 | 3 | - |
| HSRG Solution | None None | - | 0% | 0% | 43% | 0.00 | 11 | 0.6 | 2 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 39% | 0.00 | 13 | 0.7 | 3 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Willamette - Clackamas Spring Chinook Salmon Population and Related Hatchery Programs

January 31, 2009



1 Clackamas Spring Chinook Salmon

This population is part of the Upper Willamette River Chinook ESU. Historically, there were seven demographically independent populations of spring Chinook salmon in this ESU: Clackamas, Molalla/Pudding, Calapooia, North Santiam, South Santiam, McKenzie, and Middle Fork Willamette—all eastside tributaries (Meyers et al. 2003). Today, the Clackamas River population is one of four core populations (Clackamas, North Santiam, McKenzie and Middle Fork Willamette). The Clackamas River subbasin historically sustained a large spring Chinook population and may have the intrinsic capacity to sustain a large population into the future (McElhany et al. 2003) (Subbasin Plan).

According to ODFW (2001), historical spawning by indigenous spring Chinook occurred in the upper Clackamas subbasin in the mainstem and in tributaries, including Eagle Creek, Fish Creek, Roaring River, and the Collawash River. Access to spawning areas was severely impeded or prevented by the Faraday and River Mill dams from 1906 to 1939. The historic spring Chinook population declined, due to commercial fishing, lack of access to spawning grounds, and egg-taking operations. Construction of the Cazadero Dam in 1904 (RM 26.7) and River Mill Dam in 1911 (RM 23) limited migratory access to the majority of the historical spawning habitat for the spring run. In 1917, the fish ladder at Cazadero Dam was destroyed by floodwaters, eliminating fish passage to the upper basin (ODFW 1992); the ladder was not repaired until 1939 (PGE 2007). During this period, natural production of spring Chinook was restricted to the lower 23 miles of the Clackamas River and Eagle Creek (Subbasin Plan).

The recolonization of the upper Clackamas River progressed very slowly, with the average annual spring Chinook dam count (River Mill or North Fork Dam) from 1952 to 1959 being 461 (Murtagh et al. 1992). More importantly, 30% of the adult passage counts occurred in September and October. The source of the spring Chinook that recolonized the upper Clackamas Basin is not known. It most likely included some Clackamas fish that persisted below Faraday Dam, plus strays from the upper Willamette River tributaries, due to passage problems at Willamette Falls (located just above the mouth of the Clackamas) and pollution in the lower Willamette (Subbasin Plan).

Currently, natural production habitat is thought to be relatively productive in at least the Clackamas mainstem and tributaries above North Fork Dam. Spawning ground surveys for spring Chinook salmon were conducted in the Clackamas River basin from 1996 through 2007 to document timing, distribution, and abundance of natural spawning. The mainstem of the upper Clackamas River above North Fork Dam is the most important spawning area for spring Chinook salmon, accounting for an average of 85% of the redds. Only 15% are accounted for in tributaries. The mean annual redd count in the upper mainstem was 236 during the period. Redds in the upper mainstem from Sisi Creek to the head of the North Fork Reservoir are fairly uniformly distributed, with the section from the mouth of the Collawash River to Cripple Creek usually containing the highest redd densities. Of the tributaries, the Collawash River is the most heavily used by spring Chinook in the basin. Spring Chinook salmon also spawn in the lower Clackamas River below River Mill Dam, but not as heavily as above North Fork Dam. The lower Clackamas River accounted for 11% of the total redds in the Clackamas Basin in 1998 (predominantly hatchery-origin fish concentrated near McIver Park [personal communication, Todd Alsbury, ODFW, January 2008]), when both of the lower sections were surveyed. Although fall Chinook salmon also use the lower Clackamas River, spring Chinook predominate in the area just below River Mill Dam (Subbasin Plan).

The population long-term geometric mean is about 900 natural-origin spawners (McElhany et al. 2007 review draft). In recent years (1990-2005), the geometric mean of natural-origin spawners was 1,656, with a pHOS of 0.47. It has been estimated that about 20% of the spring Chinook females die before spawning.

In 1976, the ODFW Clackamas River Hatchery (located below River Mill Dam) began releasing spring-run Chinook salmon. Increases in adult returns over the North Fork Dam and increases in redd counts above the North Fork Reservoir corresponded to the initial return of adults to the hatchery in 1980 (ODFW 1992; Willis et al. 1995). Adult counts over North Fork Dam rose from 592 in 1979 to 2,122 in 1980 (Murtagh et al. 1992). Recent changes in management policy by ODFW include acclimating and releasing hatchery fish farther downstream and mass-marking all hatchery releases to allow the removal of hatchery fish ascending the North Fork Dam.

Genetic analysis by NOAA Fisheries of naturally produced fish from the upper Clackamas River indicated that this stock was similar to hatchery stocks from the upper Willamette Basin (Myers et al. 1998). This finding agrees with an earlier comparison of naturally produced fish from the Collawash River (a tributary to the upper Clackamas River) and upper Willamette River Hatchery stocks (Schreck et al. 1986). Fish introduced from the upper Willamette River have significantly introgressed into, if not overwhelmed, spring-run fish native to the Clackamas River Basin and obscured any genetic differences that existed prior to hatchery transfers.

The Upper Willamette spring Chinook ESU populations exhibit early run timing relative to other Lower Columbia River populations. Historical records indicate that spring Chinook entered the Clackamas River in March or April, sometimes even in February, prior to the Upper Willamette fish runs.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Clackamas spring Chinook are part of the Upper Willamette River Chinook Salmon ESU, which was listed as threatened under the ESA in March 24, 1999 (64 CFR 14308).
- **Population Description:** The Clackamas spring Chinook population has not been assigned a recovery designation. This is considered a core population by TRT and was given a Primary designation for the HSRG review.
- **Recovery Goal for Abundance:** Unknown.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity (e.g., from EDT):** Productivity: 3.62, Capacity: 3,003.

2.2 Current Hatchery Programs Affecting this Population

The Clackamas River Hatchery spring Chinook segregated harvest program augments sport and commercial salmon fisheries in the Clackamas, Willamette, and Columbia rivers. It provides mitigation pursuant to agreements with the Federal Energy Regulatory Commission and NOAA Fisheries for loss of habitat quantity and quality resulting from construction and operation of PGE and Corps of Engineers hydropower projects on the Clackamas and Columbia rivers, respectively.

The Clackamas River spring Chinook stock was developed from other Willamette Basin hatchery spring Chinook stock smolts released at Dog Creek (site of Clackamas Hatchery) beginning in 1976 (ODFW 1992). The Clackamas Hatchery began operation in 1979 and the first releases of spring Chinook occurred here in November 1979 (1978 brood), while the last release of smolts from adults not collected here occurred in 1989 (1987 brood). Since 1988, the Clackamas Hatchery spring Chinook broodstock has been composed entirely of returns to the Clackamas Hatchery.

Annually, approximately 300,000 pre-smolts are released from the Clackamas River Hatchery (at approximately RM 22.6) and 900,000 smolts are released into the Clackamas River at five other locations, including Cassidy Pond (RM 17; 50,000 smolts), Clackamette Cove (RM 0.5; 80,000 smolts), Foster Creek (50,000 smolts), Clear Creek (50,000 smolts), Eagle Creek (200,000 smolts) and at the hatchery (470,000 smolts) (HGMP 2004). Smolt-to-adult survival rates for brood years 1989 through 1995 ranged from 0.11 to 0.36 (HGMP 2004).

Current practices are designed to minimize the presence of hatchery-origin fish on natural spawning grounds. Returning hatchery-origin adults (identified by fin-clip or the presence of a coded-wire tag) have not been intentionally passed above North Fork Dam since 1998. Only unmarked fish are allowed to migrate above this point into the primary Clackamas Basin spring Chinook spawning grounds. There is a potential that some unmarked hatchery fish could be unintentionally passed upstream due to errors in the fin-clipping process, or as unmarked coded-wire tagged fish (double index tags through 2009). The frequency of these occurrences is currently not well known (HGMP 2004).

No quantified data exist for the percent of hatchery fish spawning naturally below North Fork Dam, though ODFW has observed that it does occur and the percentage of hatchery-origin fish is relatively high. ODFW does not believe that significant natural spring chinook production originates from this lower portion of the basin (HGMP 2004).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 47 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence PNI value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines

for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 2.4 to 2.8. Average abundance of natural-origin spawners (NOS) would increase from approximately 1,430 fish to approximately 1,700 fish. Harvest contribution of the natural and hatchery populations would go from approximately 1,600 fish to approximately 450 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

In the absence of specific harvest and conservation goals, we note that this program is operated consistent with the standards for a Primary population. An integrated program of similar size (approximately 1.0 million smolts) also could be operated consistent with these standards and could provide additional conservation safety benefits. Passage into the upper basin is regulated at North Fork Dam, which provides flexibility for this program.

Because of the existing available water sources in the Clackamas, fish are moved between facilities in the Willamette. This raises risks of pathogen transfer and straying; however, no specific problems were noted and no reasonable alternatives have been identified to alleviate this situation.

Recommendations

The HSRG offers no specific recommendations for modifying this population.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

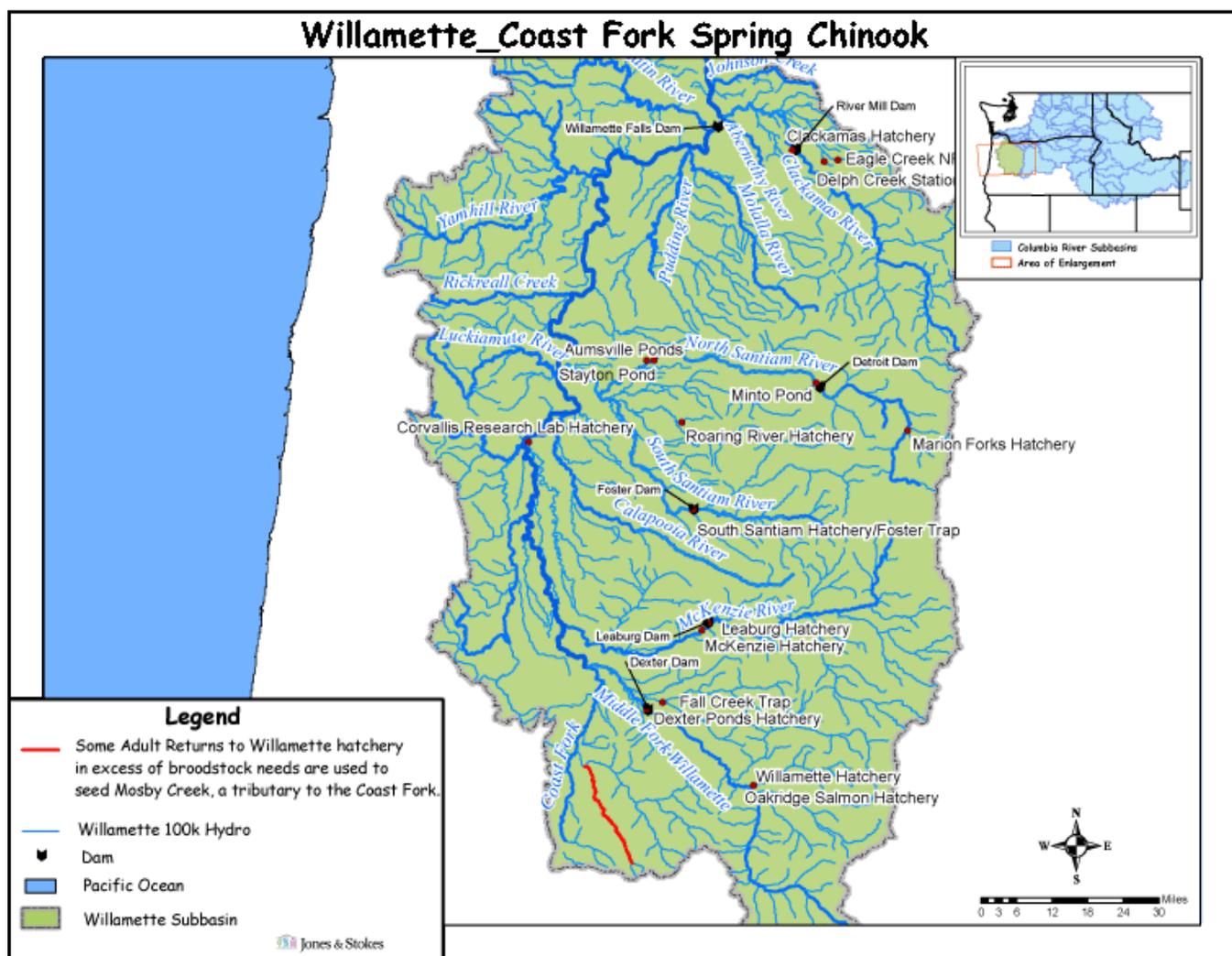
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Clackamas Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 50% | 95% | 2% | 0.00 | 1,431 | 2.4 | 382 | 0 |
| | Seg Harv | 1,077.8 | 50% | | | | | | 1,229 | |
| No Hatchery | None | - | 0% | 95% | 0% | 1.00 | 1,690 | 2.8 | 451 | - |
| | None | - | 50% | 95% | 2% | 0.00 | 1,433 | 2.4 | 382 | 0 |
| HSRG Solution | None | - | 50% | 95% | 2% | 0.00 | 1,433 | 2.4 | 382 | 0 |
| | Seg Harv | 1,077.8 | 50% | | | | | | 1,229 | |
| HSRG Solution w/ Improved Habitat | None | - | 50% | 95% | 2% | 0.00 | 1,740 | 2.7 | 464 | 0 |
| | Seg Harv | 1,077.8 | 50% | | | | | | 1,229 | |

Hatchery Scientific Review Group Review and Recommendations

Willamette – Coast Fork Willamette Spring Chinook Salmon Population and Related Hatchery Programs

January 31, 2009



1 Coast Fork Willamette River Spring Chinook Salmon

Historically, there were seven demographically independent populations of spring Chinook salmon in the Upper Willamette River Spring Chinook Salmon ESU: Clackamas, Molalla/Pudding, Calapooia, North Santiam, South Santiam, McKenzie, and Middle Fork Willamette—all eastside tributaries (Meyers et al. 2003). The Coast Fork was not recognized as an independent population and a viable self-sustaining run does not currently occur in the Coast Fork River subbasin. No Coast Fork Willamette Chinook have been known to exist since before the 20th century (HGMP 2004).

Dorena and Cottage Grove dams block upstream access to spawning areas. Also, it is likely that low flows and warm-water discharge from the dams limit downstream Chinook salmon production (ODFW 1990; Subbasin Plan). Spawning and rearing habitat is very limited below these projects. Although some such habitat is currently available above the reservoirs for a limited number of spring Chinook, it is not accessible to returning adults (HGMP 2004). After rotenone treatments in the early 1970s, juvenile Chinook were released into the Cottage Grove Reservoir, resulting in an estimated 112,000 to 345,000 Chinook smolts migrating out of Cottage Grove Reservoir. Survival through the reservoirs may be limited by the presence of bass and other non-native fish species. Survival through the dams is unknown (HGMP 2004). In recent years, a few adult spring Chinook have been outplanted into Mosby Creek, resulting in limited production (personal communication, Kelly Reis, ODFW, January 2008).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Coast Fork spring Chinook are part of the Upper Willamette River Chinook Salmon ESU, which was listed as threatened under the ESA in March 24, 1999 (64 CFR 14308).
- **Population Description:** The Coast Fork spring Chinook population is not recognized as a demographically independent population. It was given a Stabilizing designation for the HSRG review.
- **Recovery Goal for Abundance:** Unknown.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity (e.g., from EDT):** Productivity 1.5; Capacity 100 (assigned for this review).

2.2 Current Hatchery Programs Affecting this Population

No spring Chinook hatchery program currently operates in the Coast Fork of the Willamette River; however, about 30 adult spring Chinook from other programs are estimated to stray into this system annually. Under the current scenario, pHOS is estimated at 58%, even though no hatchery coho are released in the basin. Annually, approximately 17 natural-origin adults are estimated to return to the Coast Fork of the Willamette.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 30 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.5 to 1.1. Average abundance of natural-origin spawners (NOS) would decrease from approximately nine fish to approximately five fish. Harvest contribution of the natural and hatchery populations would go from approximately three fish to approximately two fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

There are no hatchery programs for fall Chinook that operate in this basin. Out-of-basin strays are estimated to make up 58% of the natural spawning population. This proportion of hatchery fish on the spawning grounds would only be consistent with designation as a Stabilizing population.

Recommendations

The HSRG recommends that this population be managed for natural production as a Stabilizing population.

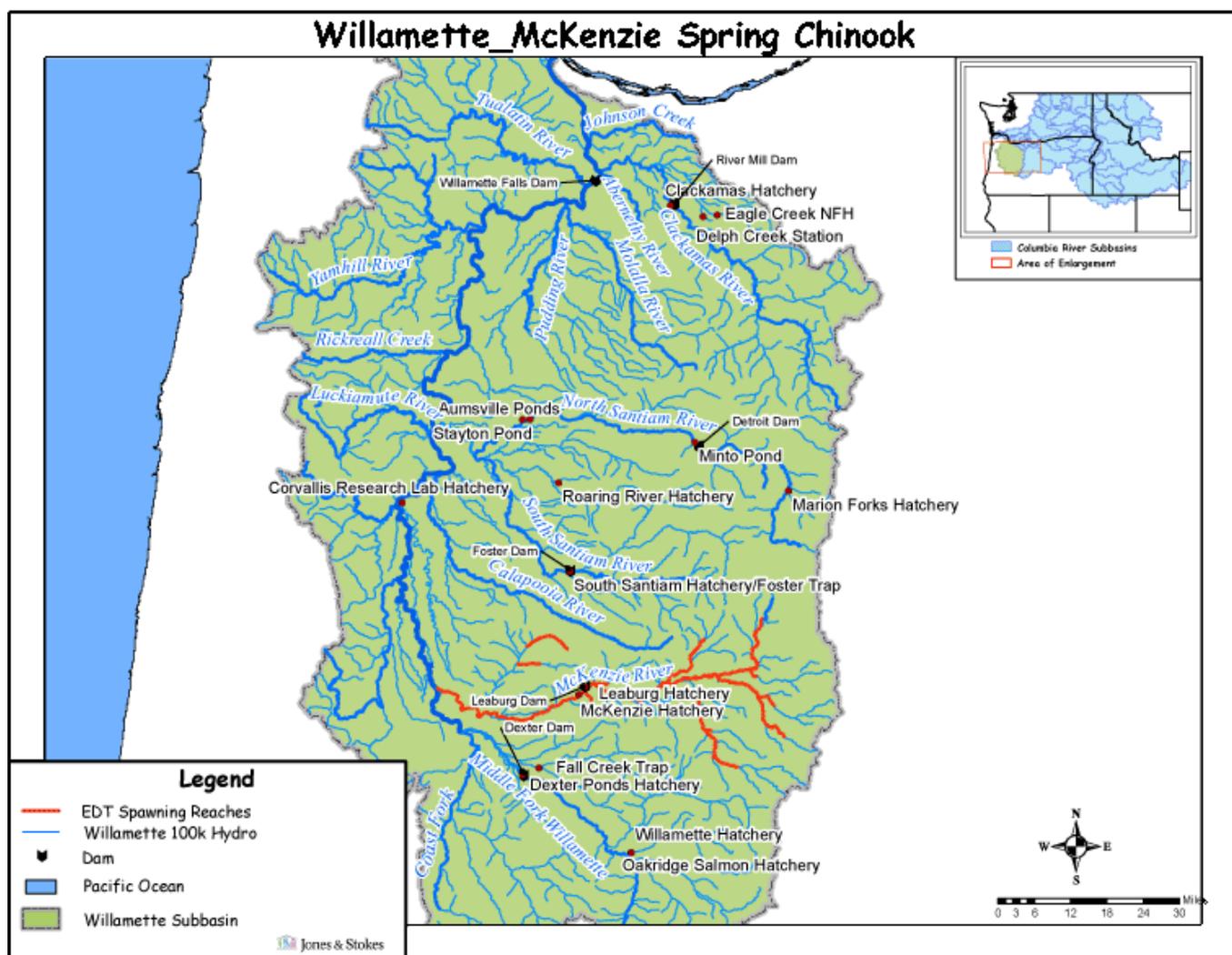
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Coast Fork Willamette Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 49% | 0.00 | 9 | 0.5 | 3 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 5 | 1.1 | 2 | - |
| HSRG Solution | None None | - | 0% | 0% | 45% | 0.00 | 10 | 0.6 | 3 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 41% | 0.00 | 12 | 0.7 | 3 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Willamette – McKenzie Spring Chinook Salmon Population and Related Hatchery Programs

January 31, 2009



1 McKenzie Spring Chinook Salmon

This population is part of the Upper Willamette River Chinook ESU. Historically, there were seven demographically independent populations of spring Chinook salmon in this ESU: Clackamas, Molalla/Pudding, Calapooia, North Santiam, South Santiam, McKenzie, and Middle Fork Willamette (Meyers et al. 2003). The McKenzie River produced roughly 40% of the spring Chinook run above Willamette Falls (Mattson 1948). Today, four core populations survive in the Clackamas, North Santiam, McKenzie and Middle Fork Willamette subbasins, which historically sustained large populations and may have the intrinsic capacity to sustain large populations into the future (McElhany et al. 2003). The McKenzie subbasin population represents an important element of the genetic legacy of the Upper Willamette ESU. The McKenzie spring Chinook salmon population has been the least influenced by intra- or inter-basin transfers of hatchery stocks and probably has retained a relatively high degree of adaptation to local watershed conditions (Subbasin Plan).

Before the Willamette Falls fish ladder was constructed, passage by returning adult spring Chinook salmon was possible only during the winter and spring high flow periods, resulting in an earlier run timing relative to other Lower Columbia River populations. The early run timing of the Upper Willamette population is viewed as an adaptation to flow conditions and optimal passage at Willamette Falls (Myers et al. 2003). This run timing adaptation for optimal flow conditions at the falls has led to significant local genetic adaptation relative to other Columbia River spring Chinook salmon (Myers et al. 2003) (Subbasin Plan).

Spring Chinook salmon begin to appear at the base of Willamette Falls (RM 26) in February. The majority of the run ascends the falls in April and May and completes its migration back to natal spawning grounds through July. Historically, passage over Willamette Falls was likely related to flow and temperature; passage increased when the river levels dropped and water temperatures exceeded 53.0 degrees F (ODFW 1990). As a result of the fish ladder at Willamette Falls, the current run of spring Chinook salmon pass the falls into July and August, which overlaps with the introduced fall run of Chinook salmon (Subbasin Plan).

The timing of the run in the McKenzie River is monitored at Leaburg Dam, where passage usually peaks in June (Howell et al. 1988). A smaller pulse moves above the dam during the September spawning period. The period of peak passage appears to depend on temperature, occurring as early as the second half of May in warmer water years and as late as the first part of July in cooler years. Homolka and Downey (1995) calculated that spring Chinook salmon upstream of Leaburg Dam spawned from very late August until mid-October in 1992, with the peak centered on September 23, representing a shift to later spawning compared to the historical pattern. From 1902 through 1907, hatchery operations on the McKenzie began egg takes in early- to mid-August, and peak egg collections generally occurred during the second week of September (Howell et al. 1988). Changes in water temperature regimes from the dams have affected the spawn timing. In addition, when compared to historical patterns, the current duration of the spawning period appears to have decreased by two-thirds or more from 1919 through 1985 (Lichatowich 2000) (Subbasin Plan).

Historical spawning areas included the mainstem McKenzie River, Smith River, Lost Creek, Horse Creek, South Fork, Blue River, and Gate Creek (Mattson 1948; Parkhurst et al. 1950). It has been estimated that historically there was suitable habitat for 80,000 fish in the McKenzie River Subbasin (Parkhurst et al. 1950). Cougar Dam, at RM 4.5 on the South Fork McKenzie River, was built in 1963 and blocked access to at least 25 miles of high-quality spawning habitat. In 1956, 805 redds were observed in the South Fork (Willis et al. 1960). Although Cougar Dam

was built with fish passage facilities, these did not function as intended and were not used to pass fish until after 1966. Construction of Blue River Dam (at RM 1.8 in 1968) blocked a smaller amount of habitat; the Blue River watershed probably supported a historical population of about 200 adult Chinook salmon (WNF BRRD 1996). The Eugene Water and Electric Board (EWEB) completed construction of its Carmen-Smith project on the upper mainstem McKenzie River in 1963. Of the three dams that make up the Carmen- Smith project, Trail Bridge Dam cut off access to about 4 miles of historical spring Chinook salmon spawning habitat and Smith Dam cut off about 3 miles. Carmen Smith Dam is above a natural barrier to migration (Tamolich pool and falls).

Currently, the McKenzie subbasin supports the largest existing population of Upper Willamette River spring Chinook salmon. From 1994 through 2001, the total escapement to the McKenzie River ranged from 2,992 to 9,548 adults, with an average of 4,726. Downstream of Leaburg Dam, most spring Chinook spawners are hatchery-produced (U.S. Army Corps of Engineers 2000). The total escapement to Leaburg Dam ranged from 1,176 (84% NOR) to 4,428 (76% NOR) adults with an average of escapement of 2,080; the weighted average composition of natural-origin fish over this time period was 72%. For the period 2001-2006, natural-origin recruits made up 60 to 84% of the spring Chinook run above Leaburg Dam, based on carcass recoveries (HGMP 2008).

Most of the current natural production of spring Chinook salmon is above Leaburg Dam (RM 39). Based on aerial redd surveys, approximately 10 to 20% of the Chinook salmon that spawn above Leaburg Dam use the lower few miles of the South Fork McKenzie River (that is, below Cougar Dam), 30 to 40% spawn in the mainstem McKenzie below the confluence with the South Fork, and 45 to 60% spawn in headwater areas above the mouth of the South Fork up to Trail Bridge Dam (USFWS 1994; ODFW 1999a).

The population long-term geometric mean is about 1,500 natural-origin spawners, which is in the very low risk minimum abundance threshold category (McElhany et al. 2007 review draft). In recent years (1990-2005), the geometric mean of natural-origin spawners was 2,104, with an average hatchery fraction of 0.329.

Juvenile McKenzie River spring Chinook salmon demonstrate a variety of outmigration and rearing patterns, varying in nature between years. Zakel and Reed (1984) defined three life history types of wild Chinook at Leaburg Dam:

- Age-0 fry that migrate in late winter through early spring
- Age-0 fingerlings that migrate in the fall
- Yearling smolts that migrate in early spring

Juvenile spring Chinook salmon have been observed passing Willamette Falls as fry, but most appear to rear in the lower McKenzie and mainstem Willamette system. Studies in the 1960s confirm the pattern of rearing in the mainstem of rivers. Scale analyses of returning adults indicated that only 10% had entered the ocean as sub-yearlings, suggesting that a large proportion of the juveniles observed migrating downstream had overwintered in the mainstem Willamette or Columbia rivers (Mattson 1963). ODFW has found spring Chinook fingerlings up some valley floor tributaries as far as 20 miles from the mainstem. Juvenile spring Chinook have been observed during the winter in seasonal streams in the lower Calapooia Subbasin (Colvin, Oregon State University, personal communication, 2004).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** McKenzie spring Chinook are part of the Upper Willamette River Chinook Salmon ESU, which was listed as threatened under the ESA in March 24, 1999 (64 CFR 14308).
- **Population Description:** The McKenzie spring Chinook population has not been assigned a designation. This population is considered a genetic legacy by TRT and was given a Primary designation for the HSRG review.
- **Recovery Goal for Abundance:** Unknown.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity:** Productivity 4.5; Capacity 8,000.

2.2 Current Hatchery Programs Affecting this Population

Currently, there is an integrated spring Chinook hatchery program at McKenzie Hatchery. Broodstock collection and all rearing occur within the McKenzie Hatchery. Broodstock goals are 500 males and 500 females. Approximately 350,000 yearlings are released onsite in November and 848,750 age 1+yearlings are released the following February/March (HGMP 2003). In addition, up to 100,000 sub-yearlings are trucked and released in the Mohawk River, tributary to the lower McKenzie River (personal communication, Kelly Reis, ODFW, January 2008).

A number of hatcheries have operated on the McKenzie River since the early 1900s. The McKenzie River Salmon Hatchery, located on Highway 126 between Leaburg and Vida, collects returning hatchery adults and some spring Chinook of natural origin. Broodstock for this program originated from fish collected upstream at the Leaburg Trout Hatchery (near Leaburg Dam) and from mainstem reaches and tributaries of the McKenzie River. Relatively few intra-basin transfers have been received compared to other Upper Willamette River Chinook salmon hatchery stocks. The 2008 HGMP for McKenzie spring Chinook provides a sliding scale for a maximum number of natural-origin fish to be incorporated into the broodstock. This number varies based on the estimated return to the McKenzie subbasin as indexed by Willamette Falls counts through May 31. Broodstock incorporates 20 to 40% natural-origin fish, provided that no more than 20% of the wild run is taken. However, until 2001, when all of the hatchery fish (through age 5) returning to the McKenzie were fin-clipped, the unmarked fish collected for broodstock may have included some of hatchery origin. Since 1996, the percentage of the broodstock of known natural origin has ranged from 9% to 25% (Kruzic 2003); according to ODFW (2003), an average of at least 15% wild fish has been incorporated into the McKenzie Hatchery broodstock each year since 1997 (Subbasin Plan).

Conversely, the rate of spawning by hatchery Chinook salmon in the wild has been high; hatchery fish constituted 50 to 95% of the natural spawners below Leaburg Dam from 2002 through 2005 (HGMP 2008). ODFW (1998) found that coded-wire tags collected from carcasses in the McKenzie River below Leaburg Dam included strays from Clackamas and South Santiam hatchery stocks that had been transferred to McKenzie Hatchery for rearing, but then released in the Clackamas and South Santiam subbasins. Similar recoveries of non-McKenzie hatchery stock were made in 1997 (ODFW 1997). To limit introgression of hatchery fish into the naturally

spawning population, NMFS (2000) directed the federal action agencies for the Willamette Basin hatchery program (the U.S. Army Corps of Engineers and BPA) to limit the number of hatchery-origin fish allowed to pass above Leaburg Dam. However, the Leaburg trap has been inadequate for removing all the hatchery fish during the peak of the run without some level of injury to natural-origin fish.

There are considerable differences in outmigration timing of native and hatchery-produced spring Chinook salmon (Kenaston 2003). Most of the sub-yearlings PIT-tagged at Leaburg Dam during the fall passed Willamette Falls the next spring (March through May). The passage of migrating yearlings tagged at Leaburg Dam during the spring peaked at Willamette Falls in May. The median transit time for tagged yearlings from Leaburg Dam to Willamette Falls was 46 days in 2001 and 53 days in 2002 (Schroeder et al. 2001 and 2002). In comparison, the median travel time to Willamette Falls for juvenile spring Chinook released from the Leaburg Hatchery was 6 days.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 577 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 180 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 3.2 to 3.6. Average abundance of natural-origin spawners (NOS) would increase from approximately 4,500 fish to approximately 5,150 fish. Harvest contribution of the natural and hatchery populations would go from approximately 3,100 fish to approximately 1,400 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is one of only two strongholds of natural spring Chinook in the Willamette Basin and therefore is important to the recovery of the ESU. Current hatchery management is consistent with designation as a Primary population.

Productive habitat exists above the dams and population abundance could be increased if juvenile fish passage were provided.

The program currently has some difficulty meeting its recently defined management objective of collecting 25% natural-origin broodstock. With more effective broodstock management, a larger integrated hatchery program could be accommodated and still be consistent with the designation of this as a Primary stock.

Recommendations

The current program could be improved by upgrading trapping facilities to collect natural-origin broodstock and manage the composition of natural spawners upstream of Leaburg Dam.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

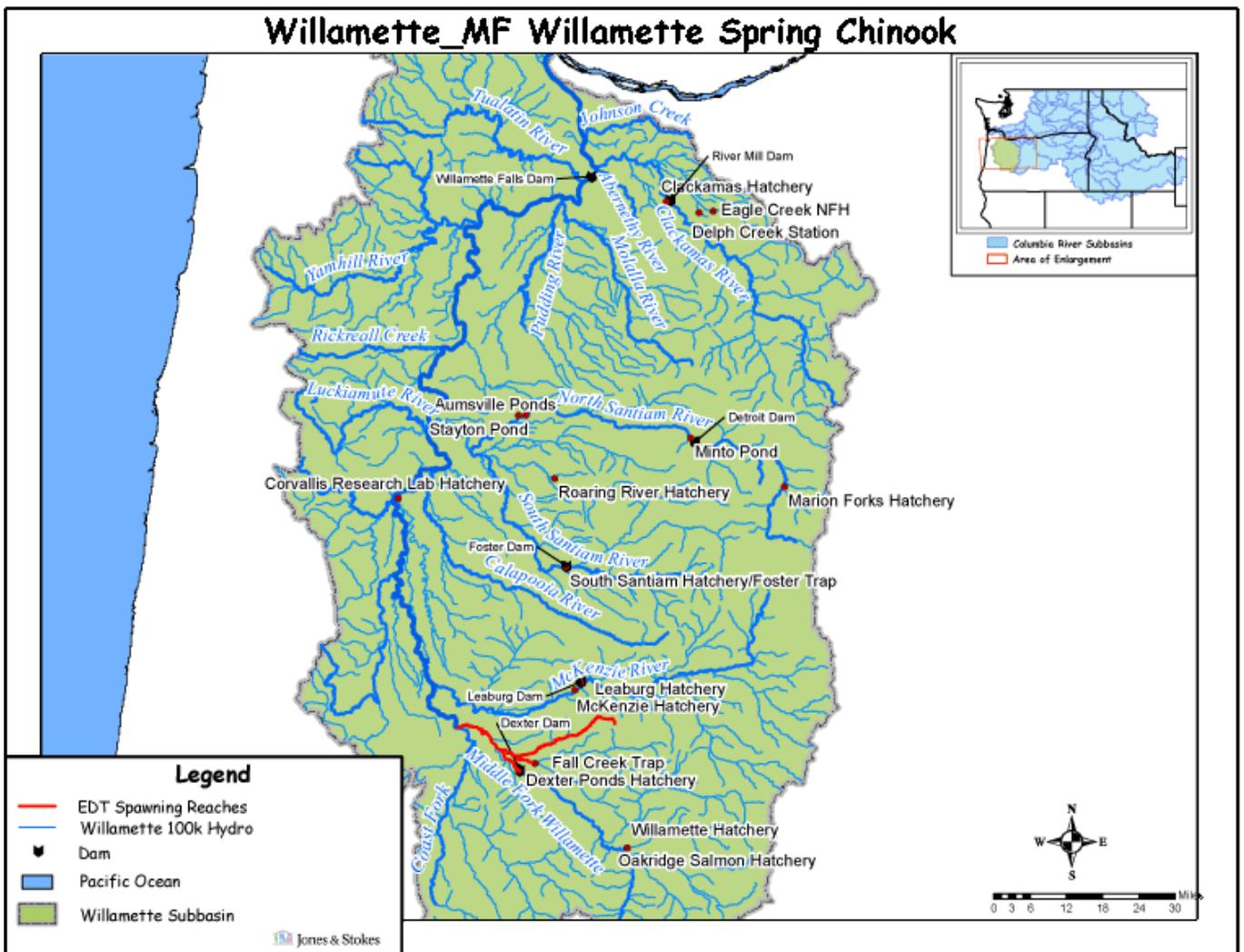
Table 1. Results of HSRG analysis of current conditions and HSRG solution for McKenzie Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 1,265.6 | 80% | 0% | 10% | 0.71 | 4,495 | 3.2 | 3,107 | 1,730 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 0.00 | 5,154 | 3.6 | 1,375 | - |
| HSRG Solution | Int Both | 1,265.6 | 80% | 0% | 10% | 0.71 | 4,495 | 3.2 | 3,107 | 1,730 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Both | 1,265.6 | 80% | 0% | 9% | 0.74 | 5,259 | 3.6 | 3,311 | 1,730 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Willamette – Middle Fork Willamette Spring Chinook Salmon Population and Related Hatchery Programs

January 31, 2009



1 Middle Fork Willamette Spring Chinook Salmon

Historically, there were seven demographically independent populations of spring Chinook salmon in the Upper Willamette River spring Chinook salmon ESU: Clackamas, Molalla/Pudding, Calapooia, North Santiam, South Santiam, McKenzie, and Middle Fork Willamette—all eastside tributaries (Meyers et al. 2003). Today, the Middle Fork Willamette is one of four core populations (Clackamas, North Santiam, McKenzie and Middle Fork Willamette) (McElhany et al. 2003; Subbasin Plan).

Historically, the Middle Fork Willamette River spring Chinook salmon run may have been the largest in the Upper Willamette Basin (Hutchison 1966; Thompson et al. 1966). Spring Chinook salmon in the Middle Fork Willamette subbasin spawned in Fall Creek, Salmon Creek, the North Fork of the Middle Fork Willamette River, Salt Creek, and the mainstem Middle Fork Willamette River (Parkhurst et al. 1950). Based on egg collections at the Willamette River Hatchery (Dexter Ponds, 1909 to the present), the estimated minimum run size is approximately 7,100 adult spring Chinook for the area that is now above Lookout Point Dam (U.S. Army Corps of Engineers, 2002). This estimate does not include fish that spawned downstream of the hatchery rack (such as in the mainstem Middle Fork Willamette River below Dexter and in the Fall Creek watershed). Mattson (1948) estimated a run size of 2,550 naturally produced spring Chinook to the Middle Fork Willamette River in 1947. The USFWS (1962) reported that approximately 450 spring Chinook salmon spawned above the site of Fall Creek Dam in the years immediately before construction (the project was completed in 1966).

Mattson (1948) estimated that 98% of the 1947 run in the Middle Fork Willamette system spawned upstream of the Lookout Point dam site and that the remaining 2% spawned upstream of the Fall Creek dam site. Construction of these dams restricted the population to only 20% of its historical spawning area below Dexter/Lookout Point and above Fall Creek Reservoir (ODFW 1990). In 1998, 10 redds were observed in the reach between the town of Jasper and Dexter Dam, which was not used for spawning before the dams were built (Lindsay et al. 1999). ODFW (1998) states that there may be a small but unquantified amount of natural production in Little Fall Creek.

Currently, the naturally spawning population of spring Chinook salmon in the Middle Fork Willamette subbasin is very small and probably is made up mostly of the progeny of hatchery fish that were released to spawn in the wild. The Fall Creek subbasin remains accessible to anadromous salmonids. Although Parkhurst et al. (1950) estimated that the Fall Creek subbasin could support several thousand salmon; by 1938 the run had already been severely depleted. In 1947, the run dwindled to an estimated 60 fish (Mattson 1948). Construction of the Fall Creek Dam (1965) included trap and haul fish passage facilities, but passage is only possible during high flow years (Connolly et al. 1992). ODFW (1995) concluded that the native spring-run population was extinct, although some natural production, presumably by hatchery-origin adults, still occurs. Of the 260 carcasses examined from the Middle Fork Willamette River (including Fall Creek), 11 (4%) were estimated to have been naturally produced (Schroder et al. 2003).

Changes in water temperature regimes from the dams have affected Upper Willamette spring Chinook spawn timing. Mattson (1962) noted that as a result of the thermal effects of Lookout Point and Dexter dams, spawning below Dexter was delayed until early October and lasted through November. Surveys above and below Fall Creek Dam in 1969 showed that spawning started in early- to mid-September and was completed by mid-October (ODFW 1990). Because naturally produced fish now make up a small portion of the Middle Fork Willamette subbasin population, little is known about the time of entry or spawning of the wild stock (Subbasin Plan).

For the period 2002 to 2007, the number of adult salmon released above Fall Creek Reservoir varied from 339 to 2,805 fish. Numbers of redds resulting from these outplants ranged from 28 to 217, with fish-to-redd ratios of 2.8 to 23.7 (personal communication, Greg Taylor, USACE, January 2008). The high ratio of fish to redds indicates a high level of pre-spawning mortality, probably as a result of handling in the trap and haul system. In the North Fork Middle Fork River, Greg Taylor reported that anywhere from 18 to 363 redds resulted from outplants of 481 to 3,765 adults spring Chinook (personal communication, USACE, January 2008). Fish-to-redd ratios varied from 2 to 94, indicating handling stress resulting from the trap and haul operation. Firman et al. (2002) estimated a natural-origin run of spring Chinook salmon to the Middle Fork Willamette subbasin of 987 fish in 2002, based on counts of naturally spawned carcasses and the number of unmarked fish taken for hatchery broodstock at Dexter Dam (Subbasin Plan).

It appears that the Middle Fork Willamette subbasin does not currently support a self-sustaining population of naturally produced spring Chinook salmon. A small amount of natural production probably does occur from spawning both above and below the dams, but is based on ODFW's releases of hatchery-origin adults into the upper Middle Fork above Hills Creek Reservoir since 1992 and into the North Fork of the Middle Fork above Lookout Point Reservoir since 1999. Natural spawning occurs in the mainstem Middle Fork Willamette below Dexter Dam, although ODFW investigations indicated that warm water temperatures cause eggs to succumb to fungus infections, and those eggs that do survive produce juveniles that emerge early (Ziller et al. 2002; Subbasin Plan).

In addition, there is a high estimated pre-spawning mortality. Although the pre-spawning mortality estimates are not considered very precise, it appears that during most years, over 80% of the females that return to the river die before spawning; second only to the Calapooia population for the highest spring Chinook pre-spawn mortality in the Willamette. Taken together, these data support the conclusion that there is little, if any, natural production of spring Chinook in the Middle Fork Willamette.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Middle Fork Willamette spring Chinook are part of the Upper Willamette River Chinook Salmon ESU, which was listed as threatened under the ESA in March 24, 1999 (64 CFR 14308).
- Population Description: The Middle Fork Willamette spring Chinook population has not been assigned a designation, although it is considered a core population by TRT. It was given a Contributing designation for the HSRG review.
- Recovery Goal for Abundance: Unknown.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (e.g., from EDT): Productivity 1.1; Capacity 1,800.

2.2 Current Hatchery Programs Affecting this Population

Currently, there is an integrated harvest spring Chinook hatchery program in the Middle Fork Willamette River at the Willamette Hatchery (on Salmon Creek at RM 1.2 and the Dexter Ponds

satellite facility (RM 16.8). Broodstock goals are 835 females and 835 males. These numbers are not always achieved; in 2002, 772 males were spawned with 795 females. Fifty-two unmarked fish (3%) were used in the broodstock (2004 HGMP). Managers expect more unmarked adults to be returning to the Middle Fork Willamette from progeny of adults released into the upper basin above the dams. The goal for this stock is to have natural-origin adults make up 30% of the broodstock, incorporating any and all natural-origin fish returning to the base of Dexter Dam.

The Middle Fork Willamette River spring Chinook hatchery program was developed to mitigate for habitat lost when Dexter, Lookout Point and Hills Creek dams were built on the Middle Fork Willamette River. Prior to dam construction, Mattson (1948) estimated the Middle Fork Willamette spring Chinook run to comprise 21% of the spawning population above Willamette Falls. With the dams blocking more than 80% of the subbasin previously used by spring Chinook (Connolly et al., 1992), the entire run returned to the hatchery. Broodstock collection and all rearing occur within the Middle Fork Willamette River subbasin. Approximately 300,000 yearlings are released onsite in November; another 1,354,148 1+yearlings are released onsite the following February/March; and another 100,000 1+yearlings are released in the Hills Creek Reservoir (personal communication, Manuel Farinas, ODFW, January 2008).

This program also supplies 855,000 yearling smolts (reared at Gnat Creek Hatchery) to the SAFE net pens in Youngs Bay.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 2,648 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 43 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.4 to 0.9. Average abundance of natural-origin spawners (NOS) would decrease from approximately 580 fish to approximately 0 fish. Harvest contribution of the natural and hatchery populations would go from approximately 3,600 fish to zero.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The hatchery population was founded by local stock and has had limited introductions from other stocks. The purpose of the program is to provide fish for harvest and to act as a gene bank for Willamette spring Chinook until access to quality habitat in the upper watershed is reestablished. Less than 1% of the historic habitat capacity is downstream of the passage barriers created by dam construction. Significant habitat capacity still exists above the projects (primarily in the North Fork), but there is no juvenile collection or passage.

The hatchery program attempts to incorporate natural-origin adults into the broodstock, but few natural-origin fish exist. If the hatchery programs were terminated, this population of fish would likely become extinct.

This program has experienced significant pre-spawning mortality. Mortality is likely caused by a combination of high temperatures and lack of appropriate adult handling and holding facilities at the Dexter and Willamette hatcheries. The multiple release strategy (spring releases and a fall release) contributes to maintaining life history diversity by encouraging the return of adults over a broader range of age classes.

Given the habitat assumptions provided, we were unable to develop any hatchery scenarios (including the no hatchery scenario) that demonstrated improvement over current natural population abundance.

Recommendations

Unless habitat conditions are better than we have assumed or passage conditions are improved, the program would be consistent only with designation as a Stabilizing population. The current program should be continued.

To address pre-spawning mortality problems, we encourage efforts to improve adult collection and handling at Dexter and adult holding facilities at Willamette. Adult holding density should be at levels that don't impair survival.

This program supports the Youngs Bay net pen program. In view of limited adult holding capacity, a different program should be considered to support this net pen program.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

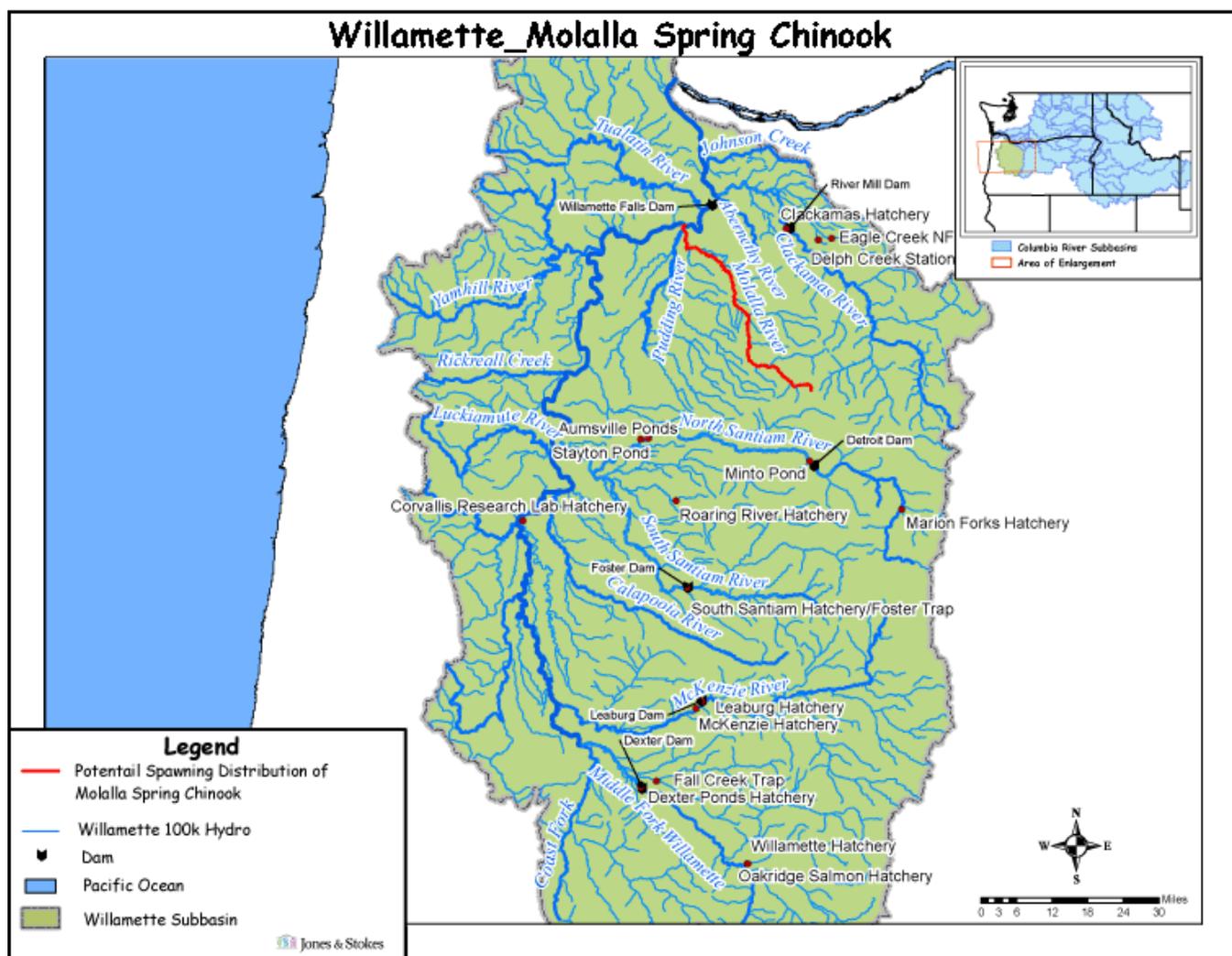
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Middle Fork Willamette Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 1,256.6 | 50% | 0% | 79% | 0.01 | 581 | 0.4 | 3,565 | 893 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 0 | 0.9 | 0 | - |
| HSRG Solution | Int Both | 1,256.6 | 50% | 0% | 79% | 0.01 | 581 | 0.4 | 3,565 | 893 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Both | 1,256.6 | 50% | 0% | 77% | 0.01 | 647 | 0.5 | 3,583 | 893 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Willamette – Molalla Spring Chinook Salmon Population and Related Hatchery Programs

January 31, 2009



1 Molalla Spring Chinook Salmon

This population is part of the Upper Willamette River Chinook ESU. Historically, there were seven demographically independent populations of spring Chinook salmon in this ESU: Clackamas, Molalla/Pudding, Calapooia, North Santiam, South Santiam, McKenzie, and Middle Fork Willamette—all eastside tributaries (Meyers et al. 2003). The Molalla natural spring Chinook population is believed to be extirpated, or nearly so (U.S. Army Corps of Engineers 2002) (Subbasin Plan).

There is very little information on the historical run size or distribution of the Molalla spring Chinook population. By 1903, the abundance of spring Chinook salmon in the subbasin had already decreased dramatically (Myers et al. 2004). Surveys in 1940 and 1941 recorded 882 and 993 spawning spring Chinook salmon, respectively (Parkhurst et al. 1950). Surveys in the 1940s observed 250 spring Chinook salmon in Abiqua Creek, a tributary to the Pudding River (Parkhurst et al. 1950). In 1947, Mattson (1948) estimated the run size to be 500. It was estimated in the 1950s that there was sufficient habitat in the Molalla River subbasin to accommodate at least 5,000 fish (Parkhurst et al. 1950).

The historical run of spring Chinook in the Molalla and Pudding watersheds was believed to have declined to the point where it could no longer sustain a viable population during the 1960s (Cramer et al. 1996). Hatchery releases of spring Chinook have been made in the Molalla watershed since 1981 in an attempt to restore the population, although there is no evidence that this population has become self-sustaining (U.S. Army Corps of Engineers 2000). There have been no recent observations of spring Chinook in the Pudding River watershed (Oregon Department of Fish and Wildlife 1999a).

A 2002 survey of 16.3 miles of stream in the Molalla found 52 redds. However, 93% of the carcasses recovered in the Molalla in 2002 were fin-clipped and of hatchery-origin (Schroeder et al. 2002). Fin-clip recovery fractions for spring Chinook in the Willamette tend to underestimate the proportion of hatchery-origin spawners, so the true fraction is likely to be near 100% (Subbasin Plan).

Recent spawning surveys (2002-2005) indicate a relatively low density of spawning in the Molalla (1.3 to 4 redds per mile) (McElhany et al. 2007 review draft). Of those fish returning, nearly all are of hatchery origin. Pre-spawning mortality in 2003 in the Molalla was estimated at 69% (9 of 13 female carcasses recovered still contained eggs and therefore indicated pre-spawning mortality). Taken together, these data indicate little, if any, natural production of spring Chinook in the Molalla.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Molalla spring Chinook are part of the Upper Willamette River Chinook Salmon ESU, which was listed as threatened under the ESA in March 24, 1999 (64 CFR 14308).
- **Population Description:** The Molalla spring Chinook population has not been assigned a designation. NOAA Fisheries has indicated that recovery of the ESU will require all remaining populations to be viable, including the Molalla. NOAA Fisheries also indicates

that offsite habitat mitigation for effects of the Corps' Willamette Basin dams likely will be directed into the Molalla watershed.

- This population is considered extirpated or nearly so by the TRT. For the HSRG review, observations and recommendations were developed based on the managers designation of the population as Stabilizing or Contributing.
- Recovery Goal for Abundance: Unknown.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity: Productivity 1.10; Capacity 100.

2.2 Current Hatchery Programs Affecting this Population

The hatchery program releasing spring Chinook in this basin (South Santiam Hatchery) is an integrated harvest and conservation program that incorporates natural-origin fish returning to Foster Dam (South Santiam River) into the broodstock. Under this program, approximately 100,000 1+yearlings are released into the Molalla River in March (HGMP 2004).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 286 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 69 fish, resulting in 87% of the natural spawning population being made up of hatchery fish from the South Santiam River.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.4 to 0.9. Average abundance of natural-origin spawners (NOS) would decrease from 43 fish to 0 fish. Harvest contribution of the natural and hatchery populations would go from 195 fish to zero.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The historical habitat in the Molalla River supported a significant sustainable natural population of spring Chinook. Currently, the productivity of the habitat is uncertain, but it is not sufficiently productive to support a self-sustaining natural population. Hatchery releases of South Santiam stock appear to be largely supporting the population. Annual stocking of this non-local stock may be contributing to the poor natural productivity in the Molalla River. Reintroduction and recovery are unlikely to be successful without habitat improvements.

This hatchery program provides modest harvest benefits.

Recommendations

Decisions about a spring Chinook hatchery program for the Molalla River depend first on how the managers designate the population: as either Contributing or Stabilizing. If it is designated as Stabilizing, the HSRG has no specific recommendations to modify the current hatchery program.

If managers believe the population is important to ESU recovery, then a Contributing designation may be appropriate. Under this designation, managers should consider the following two options along with habitat improvements and fishery protection:

- (1) Initiate a short-term reintroduction program using local broodstock and terminate the annual releases of South Santiam Chinook; or
- (2) Implement a no hatchery alternative until sufficient abundance and genetic information is collected. Terminate the stocking of South Santiam Chinook and close Chinook fishing to protect any natural-origin fish.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

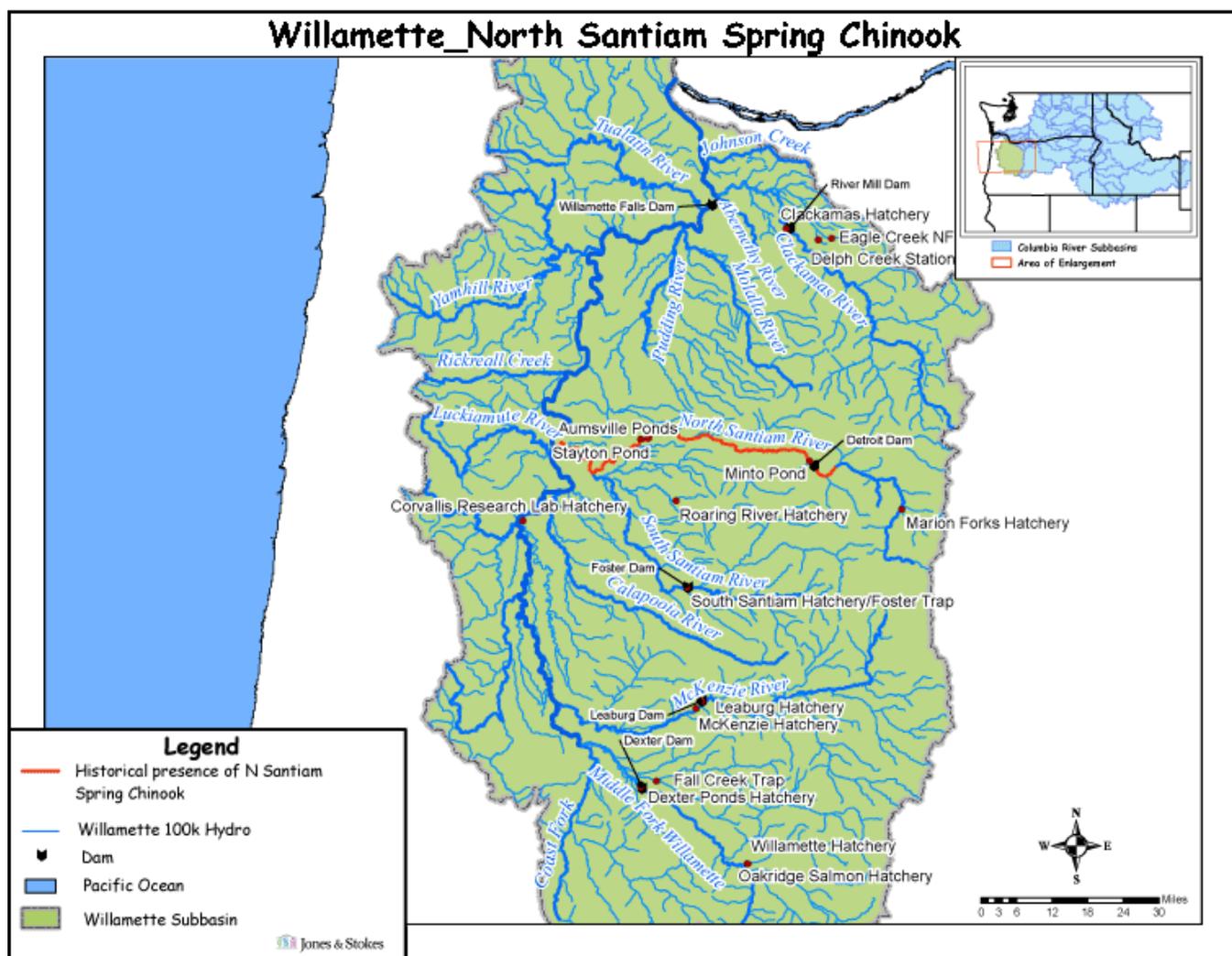
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Molalla Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 99.1 | 0% | 0% | 86% | 0.00 | 43 | 0.4 | 195 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 0 | 0.9 | 0 | - |
| HSRG Solution | Int Both | 99.1 | 0% | 0% | 86% | 0.00 | 43 | 0.4 | 195 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Both | 99.1 | 0% | 0% | 84% | 0.00 | 47 | 0.5 | 196 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Willamette – North Santiam Spring Chinook Salmon Population and Related Hatchery Programs

January 31, 2009



1 North Santiam Spring Chinook Salmon

This population is part of the Upper Willamette River Chinook ESU. Historically, there were seven demographically independent populations of spring Chinook salmon in this ESU: Clackamas, Molalla/Pudding, Calapooia, North Santiam, South Santiam, McKenzie, and Middle Fork Willamette—all eastside tributaries (Meyers et al., 2003). Today, the North Santiam is one of four core populations (Clackamas, North Santiam, McKenzie and Middle Fork Willamette). Historically, the North Santiam sustained a large population and may have the intrinsic capacity to sustain a large population into the future (McElhany et al., 2003) (Subbasin Plan).

Historically, the mainstem North Santiam River was free of natural barriers up to its headwaters, approximately 35 mainstem miles above the current site of Detroit Dam (WNF DRD 1995). Parkhurst et al. (1950) estimated that the historical habitat could accommodate at least 30,000 adults. All access to upstream spawning habitat was lost, because the dam was built without fish passage facilities (Subbasin Plan). Before Detroit Dam was built, adult Chinook salmon spawned in the upper reaches of the North Santiam River and in headwater tributaries such as the Little North Fork, Breitenbush River, Blowout Creek, and Marion Creek (WNF DRD 1994, 1996, and 1997). Mattson (1948) estimated that 71% of the spring Chinook production in the North Santiam subbasin occurred above the dam site. The mainstem Santiam River below the confluence with the North and South Santiam rivers also is believed to have supported spawning spring Chinook salmon (Wevers et al., 1992). Since dam construction, spring Chinook salmon have been restricted to the area below Big Cliff Dam. Currently, spring Chinook salmon spawn and rear primarily in the first 10 miles of the North Santiam River below the Minto barrier weir and trap (Schroder et al., 2001), but also as far downstream as Stayton (Subbasin Plan).

Estimates of the historical abundance of spring Chinook salmon in the North Santiam Subbasin range from 8,250 adults in 1934—excluding fish that spawned downstream of the current site of Detroit Reservoir (in the lower mainstem North Santiam and the Little North Santiam rivers)—to 2,830 in 1947 for the subbasin as a whole (Wallis 1963; Mattson 1948) (Subbasin Plan).

Based on the proportion of marked hatchery adults at return versus release, ODFW (1995) concluded that fewer than 300 naturally produced spring Chinook salmon adults returned to the subbasin in 1994. Currently, the Little North Santiam River watershed has the largest spring Chinook salmon production potential of all accessible streams in the Santiam River Subbasin (U.S. Army Corps of Engineers 2002). Midsummer snorkel surveys of the Little North Santiam River during the period 1991 to 1995 observed adult spring Chinook counts that ranged from 0 to a maximum of 242 in 1994. There are no dams on this tributary and it is not subjected to the negative water temperature impacts from the storage reservoirs. Systematic aerial inventories of fall and spring Chinook salmon spawning within the Santiam River watershed began in 1970. During these inventories, it was difficult to distinguish between spring Chinook salmon and the introduced fall Chinook salmon redds in the lower basin, because so much introgression of fall Chinook spawning into areas once used by spring Chinook salmon had occurred (U.S. Army Corps of Engineers 2002). From 1991 to 1994, redd counts in the North Santiam River upstream of the confluence with the Little Santiam ranged from 80 to 112 (Willis et al. 1995) (Subbasin Plan).

Approximately 296 to 661 spring chinook redds were documented annually between 2001 and 2005 in four areas of the North Santiam basin upstream of Bennett dams (McElhany et al. 2007 review draft). These surveys indicated a relatively low redd density in this population. Of the fish that return nearly all are of hatchery origin (85%-97%). In addition, as seen elsewhere in the Willamette basin, there is a high estimated pre-spawning mortality. Although the pre-spawning

mortality estimates are not considered very precise, it appears that more than half the females that return to the river die before spawning. Taken together, these data indicate little, if any, natural production of spring Chinook in the North Santiam.

Before the Willamette Falls fish ladder was constructed, passage by returning adult spring Chinook salmon was possible only during the winter and spring high flow periods, resulting in an earlier run timing relative to other Lower Columbia River populations. The early run timing of the Upper Willamette population is viewed as an adaptation to flow conditions and optimal passage at Willamette Falls (Myers et al. 2003). This adaptation to run timing during optimal flow conditions at the falls has led to significant local genetic adaptation relative to other Columbia River spring Chinook salmon (Myers et al. 2003) (Subbasin Plan).

Spring Chinook salmon begin to appear at the base of Willamette Falls (RM 26) in February. The majority of the run ascends the falls in April and May and completes its migration back to natal spawning grounds through July. Historically, passage over Willamette Falls was likely related to flow and temperature; passage increased when the river levels dropped and water temperatures exceeded 53.0 degrees F (ODFW 1990). As a result of the fish ladder at Willamette Falls, the current run of spring Chinook salmon over the falls extends into July and August, which overlaps with the introduced fall run of Chinook salmon (Subbasin Plan).

The earliest recorded observation of spring Chinook salmon spawning occurred at the North Fork Santiam hatchery rack (RM 65 at a site that is currently under Detroit Reservoir) on August 22, 1947 (Mattson, 1948). Spring Chinook salmon spawned near the rack in mid-August and continued spawning as late as the third week in October (Subbasin Plan). Changes in water temperature regimes from the dams have affected spring Chinook spawn timing. Mattson (1962) noted that as a result of the thermal effects of Lookout Point and Dexter dams, spawning below Dexter was delayed until early October and lasted through November.

Schroeder et al. (2006) reported that based on the otolith data, 12% of the spring Chinook salmon carcasses collected between the Upper and Lower Bennett dams and Minto (including the Little North Santiam River) in 2001 were wild fish; 14% collected in 2002 were wild fish; 3% collected in 2003 were wild fish; and 14% collected in 2004 were wild fish. Schroeder et al. (2006) estimated a natural-origin run of spring Chinook salmon to the North Santiam subbasin of 220 fish in 2001, 604 fish in 2002, 271 fish in 2003, and 489 fish in 2004, based on passage at Upper and Lower Bennett dams, adjusted by the percentage of non-fin-clipped carcasses with induced thermal marks recovered upstream of the dams.

ODFW released a total of 933 hatchery-origin adults into the Breitenbush and North Santiam rivers in 2000 and 1,068 adults in 2001 to assess the potential for establishing a naturally reproducing run above the reservoir. Limited surveys shortly after release indicate that these fish spawned successfully, and snorkel surveys during the summer of 2001 confirmed the presence of naturally produced juveniles (Mamoyac and Ziller 2001) (Subbasin Plan).

Spring Chinook salmon also spawn in the Little North Santiam River up to Henline Creek (Olsen et al. 1992). There appear to be declining numbers of fish in the system, with 801 counted in 1946, 273 in 1954, 236 in 1971, and 242 in 1991 (Willis et al. 1995, BLMS 1998; U.S. Army Corps of Engineers 2000); counts dropped below 16 per year during 1992 through 1995 (Willis et al. 1995). In the period 1998 through 2001, redd counts in the Little North Santiam varied from 11 to 39 (Lindsay et al. 1998) (Subbasin Plan).

Juvenile spring Chinook salmon begin their downstream migration from the North Santiam River at a variety of ages and sizes. Craig and Townsend (1946) showed that juveniles began moving

downstream during March, soon after emergence. Changes in the water temperature regimes below the dams also have affected juvenile outmigration patterns. Cramer et al. (1996) report that Chinook salmon fry in the North Santiam River move downstream in late November. This shift in emergence and migration timing is presumed to result from warm incubation temperatures below the dam. Emigration of juvenile fish was continuous throughout summer and fall.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** North Santiam spring Chinook are part of the Upper Willamette River Chinook Salmon ESU, which was listed as threatened under the ESA in March 24, 1999 (64 CFR 14308).
- **Population Description:** The North Santiam spring Chinook population has not been assigned a designation. This population is considered a core population by TRT and was given a Primary designation for the HSRG review.
- **Recovery Goal for Abundance:** Unknown.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity:** A population productivity of 2.0 and capacity of 1,000 was used in the HSRG analysis.

2.2 Current Hatchery Programs Affecting this Population

The native population of spring Chinook in the North Santiam has been affected by hatchery production since the first egg-take by the Oregon Fish Commission (OFC) in 1906 (Wallis, 1963). Although over the past century most of the fish released into the North Santiam have come from locally collected broodstock, stocks outside the ESU also have been released. The current program at Marion Forks Hatchery began in 1951, to mitigate for the loss of spring Chinook production upstream of Detroit and Big Cliff dams (completed in 1953). Hatchery fish have probably spawned in the wild every year since this hatchery program began (Subbasin Plan).

Spring Chinook adults are captured and spawned at Minto pond, located about 31 miles downstream of Marion Forks Hatchery, 4 miles below the base of Big Cliff Dam and adjacent to Minto Dam on the North Santiam River. Broodstock goals are 300 males and 300 females; however, collection has ranged from 400 to over 600 from 1992 to 2002 (2004 HGMP). All fish are reared at Marion Forks Hatchery from early egg incubation to smolt. Marion Forks Hatchery is located 17 miles east of Detroit, Oregon, between Horn Creek and Marion Creek, near the confluence with the North Santiam River (RM 73). Fish are transported to the Minto Pond for short-term acclimation or directly to the North Santiam for release (660,000 yearling release). In addition, 100,000 sub-yearling fingerlings (summer release) are released into Detroit Reservoir. These fish are to provide a resident Chinook fishery and are not expected to contribute to anadromous production.

The target number of natural-origin fish incorporated into the program's broodstock is 180 fish (30% of the broodstock), although the proportion used depends on the number of hatchery and natural-origin fish counted at upper Bennett Dam or at Willamette Falls. During low run years (less than 3,000 fish at upper Bennett Dam), up to 50% of the natural-origin fish may be used as

broodstock. During high run years (more than 7,000 fish at upper Bennett Dam), up to 20% of the natural-origin spawning population may be used. Until a low impact video counting/monitoring station is installed at the Bennett dams, counts at Willamette Falls will determine the appropriate percent of natural-origin fish in the broodstock (North Santiam Spring Chinook Draft HGMP 2007). Until 2001, it was not possible to identify wild from hatchery adults returning to Minto. In 2001 all fish used for brood were known hatchery fish. After otolith analysis of unmarked fish incorporated into the hatchery broodstock, it has been determined that <1% of the 2002 and 2003 broodstock were natural-origin fish. In 2004, 2.1% were natural-origin fish. In 2005, 3.6% were natural-origin and in 2006, 36.2% were natural-origin fish (North Santiam Spring Chinook Draft HGMP 2007).

Genetic analyses of naturally produced juveniles from the North Santiam River indicated that the fish were most closely related to other naturally and hatchery-produced spring Chinook from the Upper Willamette River ESU (although they were still significantly different, $P > 0.05$) (Myers et al. 1998). Wild fish probably have been incorporated into the hatchery broodstock since the collections began at the Minto weir. However, until the 2001 return year, hatchery fish could not be distinguished from wild fish, and the numbers of hatchery fish that have spawned in the wild and the numbers of wild fish that have been incorporated into the hatchery program have been unknown. Now that all hatchery fish are externally marked, the current management strategy, as outlined in NMFS 2000, is to incorporate some wild fish into the broodstock and to control the percentage of hatchery fish spawning in the wild (Subbasin Plan). Fish marked in the North Santiam River return primarily to the North Santiam (95%); there are few recoveries outside the upper Willamette River basin (W/LC TRT 2002) (Subbasin Plan).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 1,271 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 178 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.8 to 1.6. Average abundance of natural-origin spawners (NOS) would decrease from approximately 410 fish to approximately 300 fish. Harvest contribution of the natural and hatchery populations would go from approximately 1,750 fish to approximately 80 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The hatchery population was established with local stock and has had limited introductions from other stocks. The purpose of the current program (approximately 760,000 smolts) is to provide fish for harvest and to act as a gene bank for North Santiam spring Chinook until access to quality habitat in the upper watershed is reestablished. Significant habitat capacity still exists above the flood control facilities, but there is no juvenile collection or passage. Approximately 30% of the historic habitat capacity is downstream of the dams. If the hatchery programs were terminated, the abundance of natural spawners would drop below 500 fish.

The hatchery program attempts to incorporate natural-origin adults into the broodstock, but does not achieve the standards of a Contributing population, because of insufficient natural production. Unlike other Willamette spring Chinook programs, only one release strategy is used, due to the cold rearing water conditions.

The facility designed for adult collection currently is being used for both adult collection and as an acclimation facility. It is subject to flooding, placing the population at risk.

No quantitative information on habitat capacity and productivity was provided. Given the assumptions used, we were unable to develop any hatchery scenarios (including the no hatchery scenario) that demonstrated improvement over current natural population abundance.

Recommendations

Unless habitat conditions are better than we have assumed or passage conditions are improved, the program is consistent with the criteria for a Stabilizing population. This program should be continued. If and when habitat conditions improve, there is opportunity to manage broodstock and natural escapement composition at Bennett Dam.

Improve or replace the acclimation facilities at Minto Pond. Improvement in adult handling and holding also would be beneficial.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

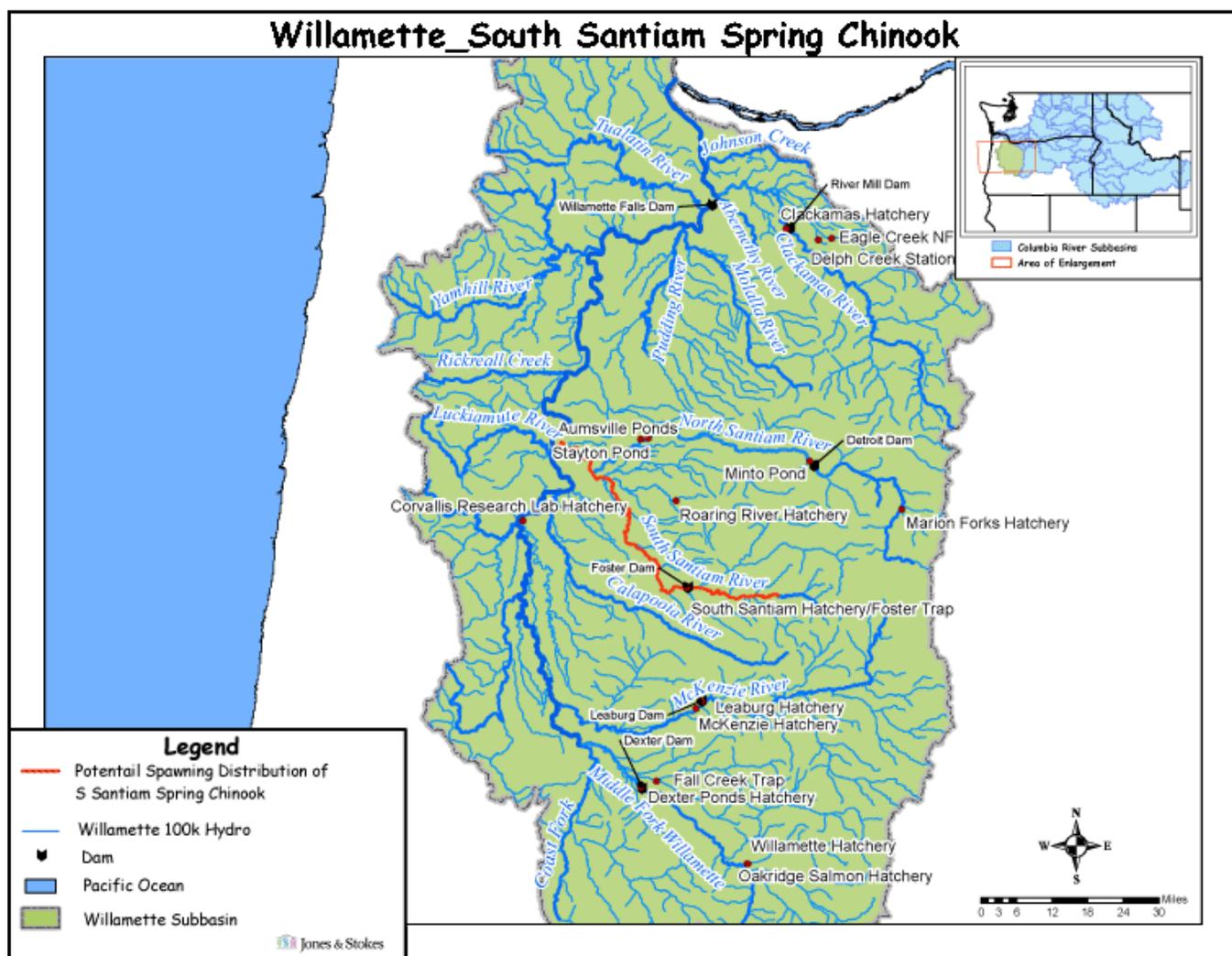
Table 1. Results of HSRG analysis of current conditions and HSRG solution for North Santiam Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 752.2 | 50% | 0% | 73% | 0.01 | 409 | 0.8 | 1,748 | 570 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 306 | 1.6 | 82 | - |
| HSRG Solution | Int Both | 752.2 | 50% | 0% | 73% | 0.01 | 409 | 0.8 | 1,748 | 570 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Both | 752.2 | 50% | 0% | 71% | 0.01 | 454 | 0.9 | 1,760 | 570 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Willamette - South Santiam Spring Chinook Salmon Population and Related Hatchery Programs

January 31, 2009



1 South Santiam Spring Chinook Salmon

Historically, there were seven demographically independent populations of spring Chinook salmon in the Upper Willamette River spring Chinook salmon ESU: Clackamas, Molalla/Pudding, Calapooia, North Santiam, South Santiam, McKenzie, and Middle Fork Willamette—all eastside tributaries (Meyers et al. 2003). The TRT did not consider the current South Santiam Spring Chinook population as a core population, a genetic legacy, or extirpated (Subbasin Plan).

Historically, spring Chinook salmon spawned in the mainstem South Santiam and Middle Santiam rivers and in all of their major tributaries, including Thomas, Crabtree, and Quartzville creeks (Thompson et al. 1966; Fulton 1968; WNF SHRD 1995 and 1996). Construction of Foster and Green Peter dams blocked or impaired access into much of the area where Mattson (1948) observed Chinook spawning during 1947. Mattson (1948) estimated an escapement of 1,300 spring Chinook salmon to the South Santiam River in 1947. USFWS (1963) reported an annual spawning run of about 1,400 above the current site of Foster Dam. Prior to construction of the dams, about 85% of the South Santiam spring Chinook production occurred above the Foster Dam site and about 15% of the run was produced below the dam site. Thompson et al. (1966) estimated a total annual run size (natural- and hatchery-origin) of 3,700 adults during the 1960s. Estimates based on the sport catch and returns to Foster Dam indicate that the minimum total (natural-origin plus hatchery-origin) run size to the subbasin during the 1970s and 1980s varied from less than 500 to nearly 10,000 per year (Subbasin Plan).

Spawning ground survey data reported in Lindsay et al. (1999) indicated a total of 163 spring Chinook salmon redds in the South Santiam below Foster Dam during September 1998. Redd counts in the South Santiam River upstream of Lebanon Dam ranged from 10 to 144 during the period 1970 to 1993 (Willis et al. 1995). Firman et al. (2002) estimated a natural-origin run of spring Chinook salmon to the South Santiam subbasin of 965 fish in 2002, based on counts of naturally spawned carcasses and the number of unmarked fish taken for hatchery broodstock at Foster Dam. Based on otoliths, Lindsay (2003) found that 14% of the spring Chinook carcasses collected between Waterloo and Foster in 2002 were naturally spawned fish and in 2004, that figure was 9% (Schroeder et al. 2006).

Beginning in 1996, ODFW transported and released spring Chinook that returned to the Foster trap into areas above Foster Reservoir in an effort to reestablish a naturally producing run. Those numbers have ranged from 120 adults to as many as 1,850 (ODFW unpublished data). Snorkel surveys conducted annually from 1998 through 2007 indicate significant natural production in the South Santiam River above Foster Dam (ODFW unpublished data). Of 762 adult spring Chinook released above Foster Dam in 2002, most (92%) were unclipped (Hunt 2003), but since that time, outplant numbers have been a mix of marked and unmarked adults, depending on how many unmarked fish remain after broodstock selection. ODFW also has released spring Chinook trapped at Foster into Crabtree and Thomas creeks, tributaries to the South Santiam below Foster, as well as into other Willamette Basin tributaries (Abiqua Creek and the Calapooia River) (Subbasin Plan).

Recent redd surveys indicate a relatively low redd density for most of the South Santiam system, but the abundance is higher than in the North Santiam (McElhany et al. 2007 review draft). However, of the fish that return, nearly all are of hatchery-origin. In addition, estimates for pre-spawning mortality were quite high, although levels in the South Santiam appear lower than in the North Santiam.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** South Santiam spring Chinook are part of the Upper Willamette River Chinook Salmon ESU, which was listed as threatened under the ESA in March 24, 1999 (64 CFR 14308).
- **Population Description:** The South Santiam Spring Chinook population has not been assigned a designation, although it was given a Contributing designation for the HSRG review.
- **Recovery Goal for Abundance:** Unknown.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity:** Productivity 3.0; Capacity 2,500.

2.2 Current Hatchery Programs Affecting this Population

The South Santiam spring Chinook program is an integrated harvest program. Proposed annual release goals into the South Santiam are 20,000 unfed fry in May; 100,000 fingerlings in June (Quartzville Creek); 300,000 yearlings in November; and 453,000 1+ yearlings in February/March. This program also provides 100,000 Chinook for release into the Molalla River.

Adults are collected at the Foster Dam fish collection facility located across the river from the South Santiam Hatchery. Broodstock goals are 450 males and 450 females. The current broodstock program goal calls for 30 to 40% of the broodstock to be of natural origin. Beginning in 2002, 100% of the returning hatchery run was marked. In 2002, 45 unmarked adults were included in the broodstock, but subsequent otolith analysis showed that 42% of those fish were actually of hatchery origin. After otolith analysis of unmarked fish incorporated into the hatchery broodstock, it was determined that in 2006, 12% of the broodstock were natural-origin (South Santiam spring Chinook Draft HGMP 2007).

Currently, all fish are reared from early egg to at least fingerling size at Willamette Hatchery, which is located one mile east of Oakridge, adjacent to Salmon Creek and three miles above its confluence with the Middle Fork of the Willamette River, near RM 42. The fish are then transported back to South Santiam Hatchery for additional rearing and on-site release, or acclimation and on-site release (HGMP 2004).

Hatchery-produced spring Chinook have been present in the South Santiam River since egg collection activities began in 1923 when a weir was placed across the river near the town of Foster (Mattson 1948; Wallis 1961). Sporadic and inefficient operation of the weir probably allowed a large portion of the run to escape upstream (Wallis 1961). In other years, the hatchery may have taken all the naturally produced adults each year for broodstock. The South Santiam Hatchery began operation in 1966 to mitigate for Foster Dam, which blocked spring Chinook salmon from nearly all their historical spawning areas (Subbasin Plan).

Schroeder et al. (2002) reported that 84% of the carcasses on the South Santiam spawning grounds in 2002 were fin-clipped, compared to 73% in the North Santiam and 77% in the Middle Fork Willamette subbasin. Most freshwater coded-wire tag recoveries from South Santiam hatchery spring Chinook salmon were made within 6 miles of the hatchery of origin (W/LC TRT

2002) (Subbasin Plan). ODFW (1998) found that coded-wire tags collected from carcasses in the McKenzie River below Leaburg Dam included strays from South Santiam hatchery stocks that had been transferred to McKenzie Hatchery for rearing, but were then released in the South Santiam subbasins (Subbasin Plan).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 285 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 245 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 1.2 to 2.4. Average abundance of natural-origin spawners (NOS) would increase from approximately 540 fish to approximately 1,250 fish. Harvest contribution of the natural and hatchery populations would go from approximately 2,000 fish to approximately 335 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where

applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The hatchery population was founded by local stock and limited introductions from other stocks have occurred. The program incorporates natural-origin adults into the broodstock. Recovery objectives have not been established. The purpose of the program is to provide fish for harvest and to act as a gene bank for South Santiam spring Chinook until access to quality habitat in the upper watershed is reestablished. Significant habitat capacity still exists above the flood control facilities, although no quantitative information on capacity and productivity was provided. Some juveniles apparently migrate successfully through Foster Reservoir, even though there are no collection facilities. About 85% of the historic production occurred above the Foster Dam site. Approximately 70% of the historic habitat (above Green Peter Dam) remains inaccessible. Without a hatchery program, there is sufficient habitat to maintain a population of approximately 1,000 spawners.

Given the assumptions used, two options were examined. A program of approximately 1,050,000 smolts releases could be operated consistent with designation as a Contributing population (pNOB=12%; pHOS=12%; 90% effective in removing out-of-basin hatchery adults). A program of up to 730,000 smolts (pNOB=15%; pHOS=7%; 90% removal of out-of-basin hatchery adults) could be operated consistent with designation as a Primary population. Alternative release sites could be developed in the Willamette Basin to compensate for reduced production and to maintain harvest benefits.

The multiple release strategy (spring releases and a fall release) contributes to maintaining life history diversity by encouraging the return of adults over a broader range of age classes.

Recommendations

Depending on the population recovery designation (Primary or Contributing), we recommend that managers follow one or other of the strategies identified above.

The adult trap at Foster Dam should be upgraded to provide better adult handling and sorting capabilities to meet program goals.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

Table 1. Results of HSRG analysis of current conditions and HSRG solution for South Santiam Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Harv | 1,123.2 | 90% | 0% | 32% | 0.24 | 537 | 1.2 | 1,999 | 1,899 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 0.00 | 1,253 | 2.4 | 334 | - |
| HSRG Solution | Int Harv | 1,022.3 | 97% | 0% | 11% | 0.52 | 717 | 1.8 | 2,107 | 2,246 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Harv | 1,022.3 | 97% | 0% | 8% | 0.61 | 1,071 | 2.1 | 2,202 | 2,246 |
| | | | | | | | | | | |

1 Upper Willamette Fall Chinook Salmon

This population consists of introduced tule fall Chinook salmon naturally produced in Willamette River tributaries above Willamette Falls. Prior to laddering of Willamette Falls (RM 23), passage of returning adult salmon was only possible during winter and spring high flow periods. Fall Chinook were not present above Willamette Falls before ladder installation and hatchery introductions of fall-run Chinook into upstream tributaries. Summer flows in the Willamette are higher and cooler than before 13 multipurpose USACE dams were constructed. When combined with passage improvements at Willamette Falls and hatchery inputs, this improved water quality has helped establish upriver runs of fall Chinook that were not present historically (Altman, Henson, and Waite 1997; Subbasin Plan).

Fall Chinook spawn in the lower reaches of the major eastside Willamette tributaries and the mainstem Willamette River. Systematic aerial inventories of fall and spring Chinook salmon spawning within the Santiam River watershed began in 1970. During these inventories, it was difficult to distinguish between spring Chinook and the introduced fall Chinook salmon redds, because so much introgression of spawning fall Chinook has occurred into areas once used by spring Chinook salmon (U.S. Army Corps of Engineers 2002). It is likely that only redds observed in the uppermost reaches (upstream of Stayton on the North Santiam River) were attributed to spring Chinook salmon (Subbasin Plan).

This population exhibits an ocean-type life history. Adult fall Chinook spend a relatively short time in freshwater. They enter the Willamette River in July and August, overlapping the tail end of the spring-run Chinook, with peak returns in September. Spawning commences in September and October. Chinook fry emerge in the spring. Juvenile fall Chinook spend relatively little time in the natal tributaries; they begin moving downstream toward the estuary during the spring and summer. Recent (2000 to 2006) average adult fall Chinook fish counts at Willamette Falls were 1,190 fish.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: The Upper Willamette fall Chinook are not part of any Chinook salmon ESU.
- Population Description: The Upper Willamette fall Chinook population has not been assigned a population designation.
- Recovery Goal for Abundance: NA.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (e.g., from EDT): Productivity 1.5; Capacity 100 (assigned for this review).

2.2 Current Hatchery Programs Affecting this Population

Currently, there are no fall Chinook hatchery programs in the Willamette River basin. The last release was in the mid-1990s from Stayton Pond (South Santiam satellite acclimation facility); ODFW discontinued releasing hatchery fall Chinook in 1996. These releases of the tule fall Chinook ranged from 5 to 12 million smolts annually.

Estimated number of hatchery strays affecting this population:

- The extent of straying of hatchery Chinook from lower Columbia hatcheries into the upper Willamette is unknown. It is likely to be low.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Since this population is not part of any Chinook ESU, there was no analysis done to determine the effects of removing hatchery influence on this population.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals.

Observations

This population was not historically present in the Upper Willamette and is not part of any Chinook salmon ESU.

Recommendations

The HSRG has no recommendations for this population.

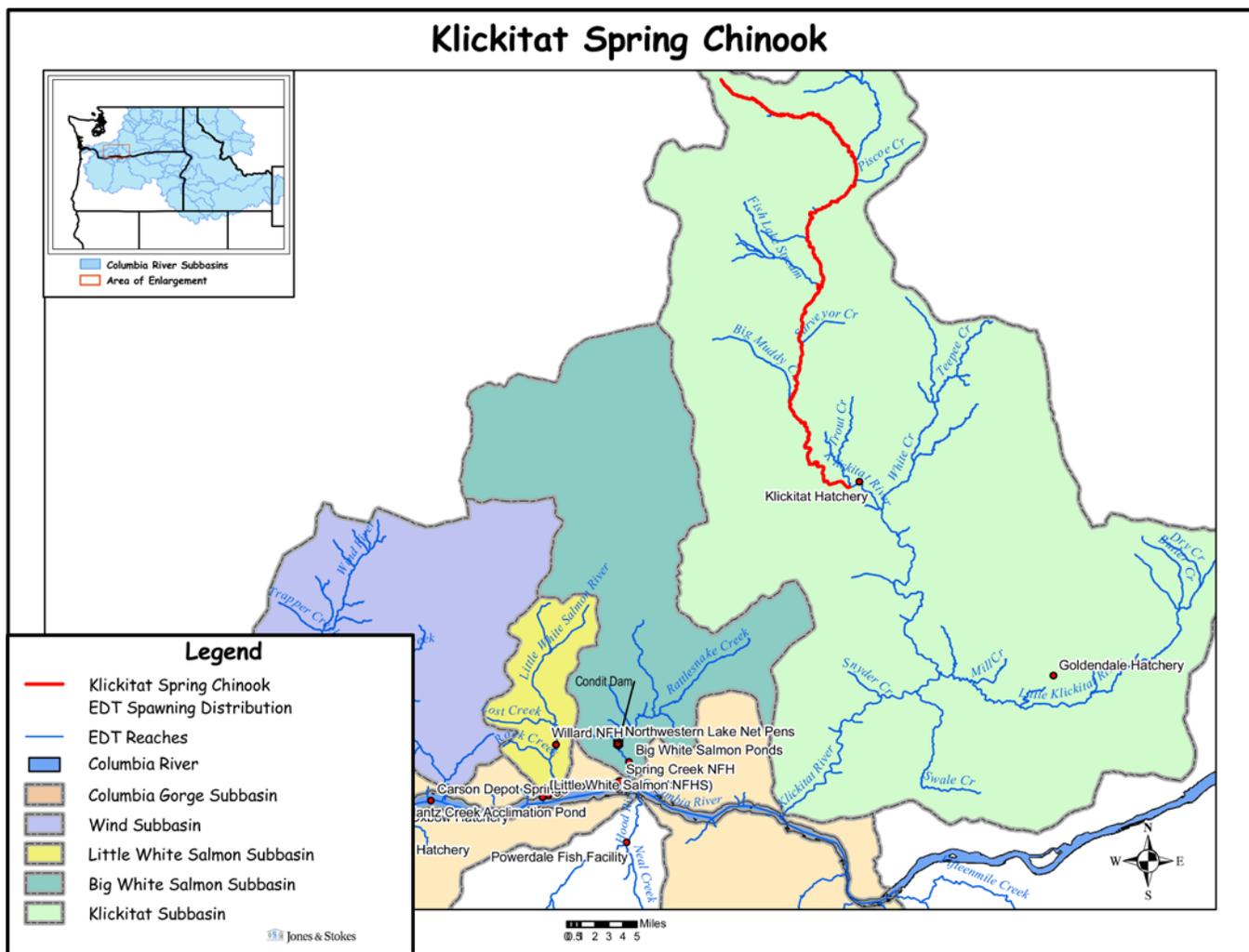
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Upper Willamette Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | | | | | | | | | |
| | None | - | 0% | 0% | 0% | 0.00 | 0 | 0.7 | 0 | - |
| No Hatchery | None | | | | | | | | | |
| | None | - | 0% | 0% | 0% | 0.00 | 0 | 0.7 | 0 | - |
| HSRG Solution | None | | | | | | | | | |
| | None | - | 0% | 0% | 0% | 0.00 | 1 | 1.0 | 1 | - |
| HSRG Solution w/ Improved Habitat | None | | | | | | | | | |
| | None | - | 0% | 0% | 0% | 0.00 | 7 | 1.1 | 3 | - |

Hatchery Scientific Review Group Review and Recommendations

Klickitat Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Klickitat Spring Chinook

Bryant (1949) cited reports of large spring Chinook runs in the Klickitat River and a significant tribal fishery at Lyle Falls (RM 2) prior to 1920, despite difficult passage at the falls. By 1951, the annual spring chinook run varied from 1,000 adults to 5,000 adults (WDFW 1951, Sharp 2000). The Klickitat Hatchery (RM 42.5) and two fishways at Lyle Falls were constructed in 1952, using Mitchell Act funds. Managers trapped spring Chinook broodstock at the upper fishway each year from 1952 through at least 1959. Estimates of spring Chinook run sizes ranged from 1,614 fish to 3,488 fish. Since 1977, estimates of spring Chinook (adults plus jacks) returning to the Klickitat River mouth have ranged from about 500 to 5,300 fish, averaging about 1,900 fish annually. In-basin harvest has ranged from under 100 to nearly 1,800 fish, averaging about 700 fish annually. Tribal fishers account for nearly 75% of the harvest on average since 1977 (Klickitat Subbasin Plan 2004).

Spring Chinook spawning occurs between Leidl Bridge (RM 32) and McCormick Meadows (RM 84). The bulk of spawning (96% in 1998) occurs between the confluence with Big Muddy Creek (RM 54) and Castile Falls (RM 64). Only 3% spawned above the Castile Falls. Spawning is limited in the reach between the confluence with Big Muddy Creek and the Klickitat Hatchery (none in 1998). Spring Chinook spawning generally occurs above the hatchery from mid-August to mid-September and from mid- to late-September in the area downstream from the hatchery. Spring Chinook spawning is not known to occur in tributaries (Klickitat Subbasin Plan 2004).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Native Klickitat spring Chinook are part of the Middle Columbia Spring-run Chinook ESU, which NOAA has determined does not warrant listing under the ESA at this time.
- Population Designation: Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette results in a designation of Primary.
- Current Viability Rating: Unknown.
- Recovery Goal for Abundance: Unknown.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (from EDT): Productivity 6.2; Capacity 607; with improved passage at Castile Falls – Productivity 6.5; Capacity 1,271.

2.2 Current Hatchery Programs Affecting this Population

Spring Chinook are native to the Klickitat; however, there is long history of hatchery releases of non-native stocks such as Carson, Willamette and Cowlitz Chinook (SaSSI 2002). The original spring Chinook program at the Klickitat Hatchery began with adults trapped in the Klickitat River and was supplemented with eggs from the Carson National Fish Hatchery. Currently, an integrated program is producing Spring Chinook at the Klickitat Hatchery for both harvest and conservation measures. Prior to 2006, only adipose-clipped hatchery-origin fish were to be

included in the brood. After 2006 an unknown number of natural-origin fish were to be included in the brood in order to properly integrate the hatchery production with the natural population (HGMP 2004). Each year an average of 999 adults (9-year average including jacks) are collected from adults volunteering to the rack at the Klickitat Hatchery. Adults are diverted into the hatchery by a low head barrier dam (not a total blockage). Some adults are able to pass the barrier dam and spawn in natural production areas above the hatchery.

Two releases are made: 243,000 fingerlings (8-year average) at 61 fish per pound are trucked up-river for release in early May to reduce densities at the hatchery when there is a significant overage of spring Chinook fingerlings; and another 610,000 yearlings at 7.2 fish per pound are volitionally released in early March from the hatchery as required by US v. Oregon. The fingerling release is made only occasionally, after approval from the managers. All releases are adipose-clipped and 17% are coded-wire tagged.

Current releases include 600,000 yearlings (15 fish per pound), volitionally released in early March. The YN/YKFP has discontinued fry release in the upper basin. All releases are adipose-clipped and 17% are coded-wire tagged.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 195 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 37 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 1.8 to 3.6. Average abundance of natural-origin spawners (NOS) would increase from 335 to 570. Harvest contribution of the natural and hatchery populations would go from 1,080 to 463.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is a Primary population that is currently not achieving HSRG guidelines for a Primary designation.

The production goal for the program is 800,000 smolts to be reared and released from the Klickitat Hatchery. Current adult collection infrastructure limits the ability to achieve a properly integrated program. The program has experienced poor survival due to water source, infrastructure and disease issues. The main purpose of the current hatchery program is to provide harvest. If operated in a manner consistent with HSRG guidelines, this population could also contribute to conservation goals for the population.

Selective sport harvest was implemented in 2006. Tribal harvest is non-selective.

The habitat above Castile Falls has recently become accessible to spring Chinook and potentially can double the natural production potential for the Klickitat River. The HSRG analysis of this population included this habitat component.

Recommendations

Primary population guidelines could be achieved by increasing the percent natural-origin broodstock in the program. To achieve this objective, a lower river broodstock collection facility is needed. Such a facility is expected to be complete at Lyle Falls by 2010. Additional broodstock will be collected at Klickitat Hatchery and the Castile Falls collection facility. Spawning, rearing and release will occur at Klickitat Hatchery. A program of up to 800,000 smolts with a pNOB of 30% and a pHOS of 14% would have a PNI of 0.69.

There are apparent opportunities to improve survival by reducing rearing densities, exploring alternative water sources during rearing, and addressing disease issues.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

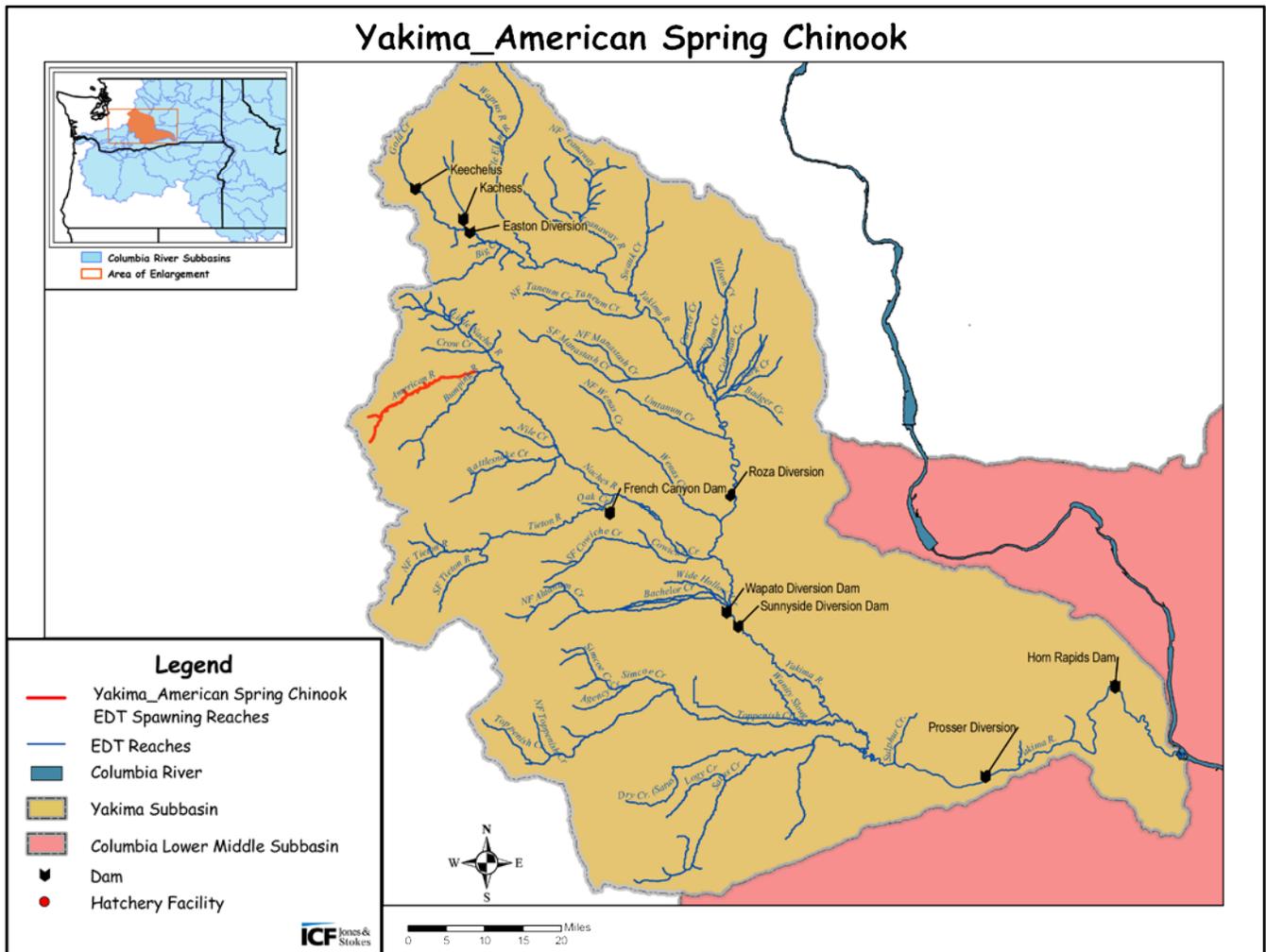
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Klickitat Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 831.2 | 80% | 0% | 36% | 0.10 | 335 | 1.8 | 1,080 | 305 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 570 | 3.6 | 463 | - |
| HSRG Solution | Int Both | 800.8 | 95% | 0% | 14% | 0.69 | 470 | 3.8 | 1,940 | 316 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Both | 800.8 | 95% | 0% | 11% | 0.73 | 617 | 4.5 | 1,999 | 316 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

American River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 American River Spring Chinook

The Yakima subbasin supports three genetically and demographically distinct stocks of spring Chinook: the American River stock (numerically smallest), the Naches River stock (numerically intermediate) and the upper Yakima stock (numerically largest). Estimates of the size of historical Yakima spring Chinook returns (all stocks) range from approximately 50,000 (Kreeger and McNeil 1993) to 200,000 (Yakima Subbasin Plan 1990). Currently, about 13% of Yakima spring Chinook are American River stock. If current and historical stock composition is similar, the historical American River population may have been as small as 6,500 or as large as 26,000 fish. From 1981 through 2007, escapement to the American River ranged from 22 to 1,918, with a mean of 502 fish. Hatchery-reared spring Chinook have never been released in the American River. Like the upper Yakima and Naches stocks, returns and escapements have increased markedly in recent years, although the year of increase in the American is 2001 instead of 2000 (probably due to the fact American River fish are almost entirely age-5 whereas Naches and upper Yakima fish are predominantly age-4). Mean escapement from 1982 to 2000 was 395, while from 2001 to 2007, mean escapement was 869 (Bill Bosch, Yakama Nation, personal communication, 2007). Although the first spring Chinook returns from the Cle Elum Supplementation and Research Facility (CESRF) occurred in 2000 (jacks) and 2001 (adults), no marked CESRF fish have been recovered during intensive spawning surveys in the American River watershed (Dave Fast, Yakama Nation, personal communication, 2007).

Since 1982, in-basin harvest of NORs has ranged from 25 to 2,305, with a mean of 608. Assuming harvest is proportional to the mean relative abundance of Yakima spring Chinook stocks, the mean annual harvest of Upper Yakima, Naches and American River NORs has been 365, 163 and 79, respectively. Most of the Naches and American fish were taken in the non-selective tribal fishery. However, terminal sport fisheries in 2002, 2004 and 2008 (no sport fishery in 2003, 2005-2007) were mark-selective fisheries targeting adipose-clipped upper Yakima CESRF hatchery fish in order to reduce pHOS on the upper Yakima River spawning grounds.

Spring Chinook spawning in American River occurs almost exclusively in the American River itself (not in tributaries) and is concentrated between RM 1 and RM 15. Spawning generally occurs from late July or early August through September (Yakima Subbasin Plan).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Native Naches spring Chinook are part of the Middle Columbia Spring-run Chinook ESU, which NOAA has determined does not warrant listing under the ESA at this time.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette results in a designation of Primary.
- **Current Viability Rating:** Unknown; SaSSI rates as depressed.
- **Recovery Goal for Abundance:** NA, because not listed.
- **Productivity Improvement Expectation:** 1.17 to 1.28 (C. Frederickson, Yakama Nation, personal communication).

- Habitat Productivity and Capacity (from EDT): Productivity: 3.89; Capacity: 418.

2.2 Current Hatchery Programs Affecting this Population

No hatchery-reared spring Chinook have ever been released in the American River, and no marked hatchery fish have ever been recovered during American River spawning surveys (Dave Fast, Yakama Nation, personal communication, 2007).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 4 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 4.1 to 4.3. Average abundance of natural-origin spawners (NOS) would increase from 381 to 395. Harvest contribution of the natural and hatchery populations would go from 122 to 126.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution

(Recommendations) that appeared to be consistent with manager’s goals; however, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The American River population of spring Chinook is genetically distinct, due to age structure that is predominantly 5-year-old fish. This population exists in cold water at a high elevation, and has a spawn timing that begins in late July and ends by early September. Any out-of-basin strays that did migrate into the American would likely be temporally excluded from successfully spawning with the local population. The pHOS for this primary population is less than 5%.

Recommendations

The HSRG recommends that managers continue to monitor the American River population of spring Chinook and use in-season adult return estimates to regulate the selective sports fishery in the lower Yakima River. Develop adult monitoring facilities in the lower Naches to monitor adult returns.

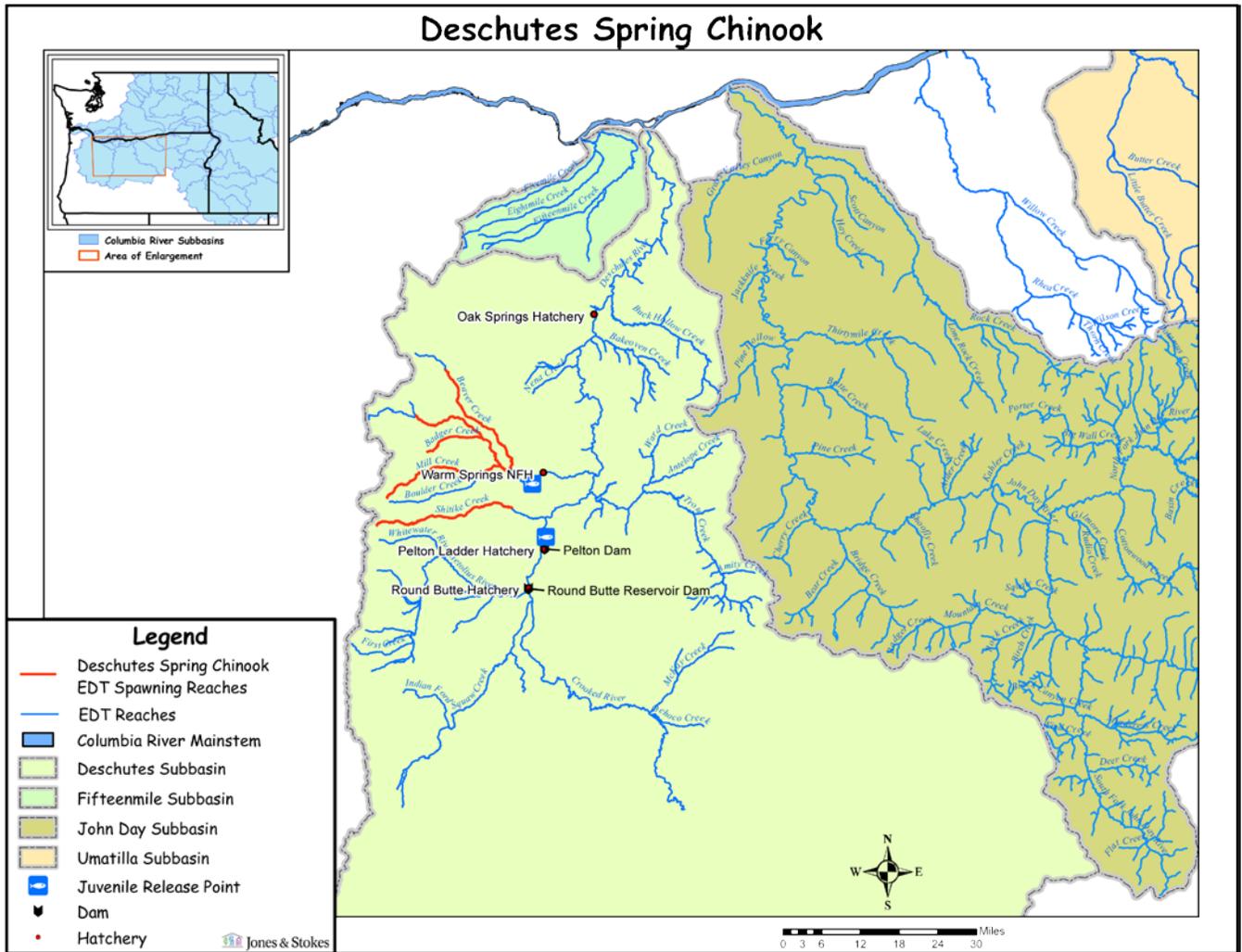
Table 1. Results of HSRG analysis of current condition and HSRG Solution for American River Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 381 | 4.1 | 122 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 395 | 4.3 | 126 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 383 | 4.1 | 122 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 436 | 4.6 | 139 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Deschutes Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Deschutes Spring Chinook

The Deschutes River enters the Columbia at RM 205 above Bonneville and The Dalles dams, draining 10,500 square miles (the second largest subbasin in the state). It originates in the Cascade Mountains and flows north along the eastern margin of the hills where the Cascades to the west meet the low-lying flats to the east.

Dam construction in the Deschutes system has cut off much of the historical spawning grounds used by spring Chinook. Construction of Cove Power Plant in 1910 on the Crooked River and the subsequent construction of Ochoco Dam, Bowman Dam, Crane Prairie Dam, Wickiup Dam, Round Butte Dam and Pelton Dam have led to a division of habitat, restricting spring Chinook to only a quarter of their historic spawning range. The wild spring Chinook run averages 1,780 adults returning to spawning grounds in the Warm Springs River and Shitike Creek drainages on the Warm Springs Reservation. Fish managers have no evidence that wild spring Chinook spawn in the mainstem lower Deschutes River or other tributaries. Run size varies considerably from year to year, with annual wild spring Chinook numbers since 1977 ranging from 241 to 3,460 fish (French and Pribyl 2004). These numbers could increase in the near future if passage past the Pelton Round Butte Project is restored, as is called for in the recent FERC relicensing process.

Currently, the Warm Springs River produces the majority of natural spring Chinook in the system, with an estimated smolt capacity of 132,000 smolts (ODFW 1977). The number of juvenile spring Chinook migrants averaged 78,736 for brood years 1978 through 1998 (Deschutes Subbasin Plan). Adult spawner surveys by the Confederated Tribes of the Warm Springs averaged 341 redds counted per year, with a range from 62 in 1995 to 752 redds in 2001. Spawner surveys made in Shitike Creek between 1982 and 1995 reported an average of 49 adult spring Chinook (ODFW 1997).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Naturally spawning spring Chinook in the Deschutes system are included in the Middle Columbia River Spring-run Chinook ESU, which was determined to not require listing under the ESA in 1998.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the lower Columbia and Willamette results in a designation of Primary for Deschutes Spring Chinook.
- **Current Viability Rating:** Unknown.
- **Recovery Goal for Abundance:** Unknown.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity (from EDT):** Productivity: 4.0; Capacity: 1300.

2.2 Current Hatchery Programs Affecting this Population

Two hatchery programs currently release spring Chinook into the Deschutes system.

A program operated by the Confederated Tribes of the Warm Springs spawns approximately 463 broodstock (1990-2001 average) with a 1990 high of 737 adults and a 1994 low of 51 adults. During the first four years of operation (1978-1981), the program collected 100% wild returns for use as broodstock and from 1978 to 1987, the proportion of wild fish in the broodstock averaged 68%. From 1993 to 2002, low wild returns resulted in hatchery collections with an average of only 3% wild returns for inclusion in the broodstock. The Hatchery Genetic Management Plan describes the program as integrated, but hatchery managers describe the program as segregated, pointing out that few wild fish are included in the broodstock. A weir near the mouth of Warm Springs Creek allows the managers to remove most of the hatchery returns to prevent them from spawning in the wild (pers. comm., Warm Springs Hatchery managers). Broodstock are collected at the Warm Springs Hatchery between May 8th and August 25th and are held until spawning. Adults are mated 1:1 and fertilized eggs are incubated with one family to each individual Heath tray. Juveniles are reared at the Warm Springs Hatchery on Warm Springs River water and are released in two separate groupings. Approximately 599,510 juveniles (1990-2001 average) are forced out of the hatchery in April at about 15 fpp (1990-2001 average), with approximately 62,674 juveniles (1990-2001 average) volitionally released in November at about 16 fpp (1990-2001 average). The program objective is to release approximately 750,000 juveniles – 90% as spring yearlings (675,000 fish) and 10% as fall subyearlings (75,000 fish).

ODFW also operates a spring Chinook program in the Deschutes subbasin at the Pelton Trap/Round Butte Hatchery, rearing and releasing Deschutes River spring Chinook (ODFW Stock 066). ODFW Stock 066 is not included as part of the Middle Columbia River Spring Chinook ESU. This program operates as a segregated harvest program collecting only Round Butte-origin adults identified by coded-wire tags returning to the Pelton Trap. The program goal is to collect 1,200 adults for releases of 320,000 smolts to the Deschutes, 125,000 smolts to the Hood, and an undetermined number of eyed eggs or unfed fry for restoration (Round Butte Spring Chinook HGMP 2004). AHA model runs indicate that this equates to 396 adults for the Deschutes River release. Mating is 1:1 and jacks are included in the broodstock. Juveniles are incubated and reared at Round Butte Hatchery until November when they are transferred to the Pelton Trap for acclimation over the winter. After 4-5 months of rearing at the Pelton Trap, the juveniles are volitionally released into the Deschutes River.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 40 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 26 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly

greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 3.2 to 3.8. Average abundance of natural-origin spawners (NOS) would increase from approximately 802 fish to approximately 1,021 fish. Harvest contribution of the natural and hatchery populations would go from approximately 1,775 fish to approximately 232 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The management goal is to sustain natural production and harvest.

Productive habitat exists above the Pelton Round Butte Project and population abundance could be increased if fish passage were provided.

The current Warm Springs integrated hatchery program (approximately 675,000 yearling smolts; 75,000 fall subyearlings) has a PNI less than 0.5, which is inconsistent with the goals for a Primary population. Straying from the Round Butte segregated program appears to be minimal. The Round Butte program is occasionally used to backfill production at Warm Springs Hatchery, but releases are differentially marked from Warm Springs stock. Round Butte stock adult returns can be effectively segregated from the Warm Spring natural and hatchery components at the Warm Springs weir.

Recommendations

Operating the Warm Springs Hatchery program as a conservation and harvest program (with a PNI greater than 0.67) by increasing the percent of natural-origin broodstock to 20 percent and operating the Round Butte segregated program at its current size (approximately 320,000 smolts) would be consistent with a Primary designation for the Deschutes spring Chinook population.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

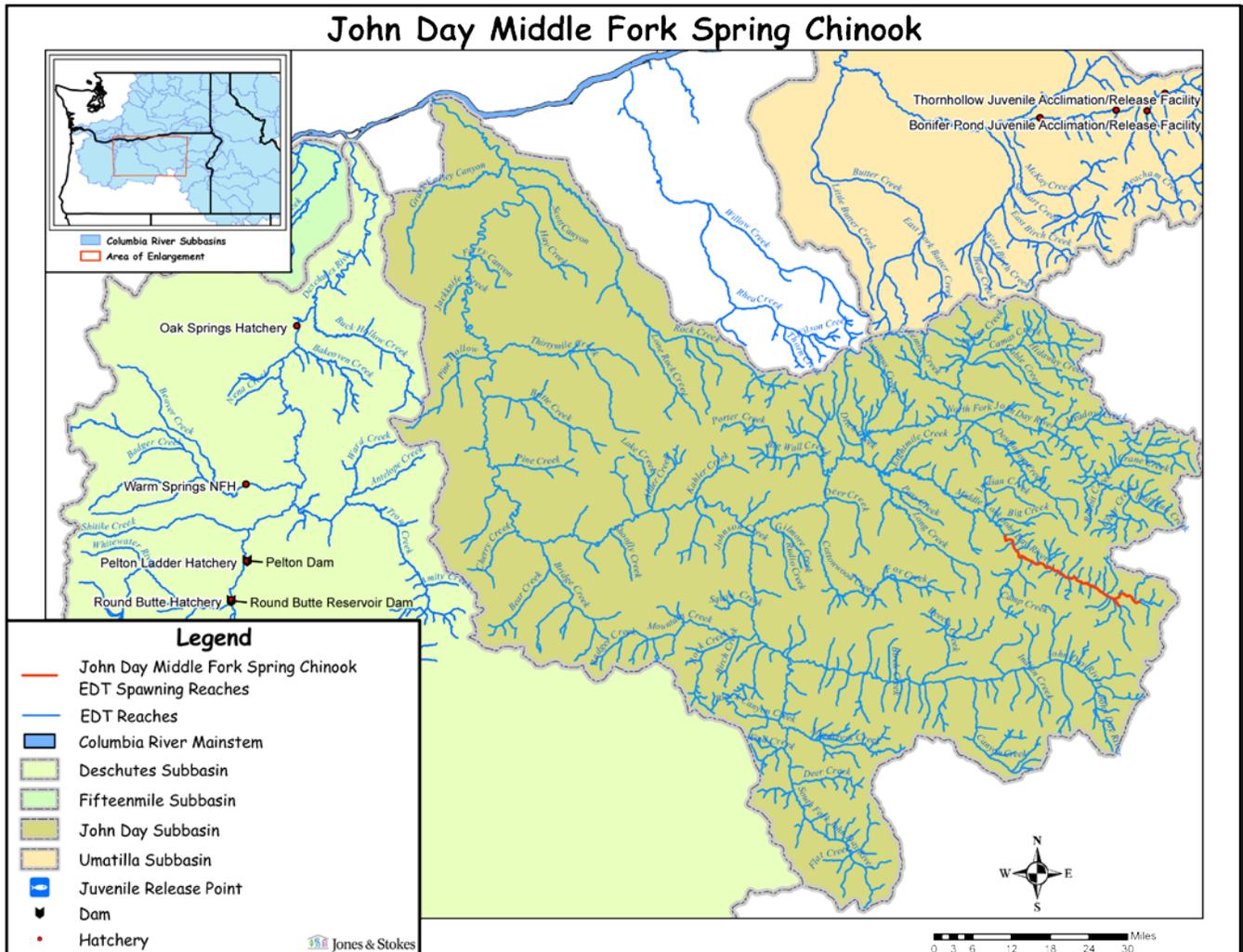
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Deschutes Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Harv | 746.9 | 95% | 50% | 6% | 0.62 | 802 | 3.2 | 1,301 | 1,012 |
| | Seg Harv | 320.6 | 95% | | | | | | 474 | 255 |
| No Hatchery | None None | - | 0% | 50% | 0% | 1.00 | 1,021 | 3.8 | 232 | - |
| HSRG Solution | Int Harv | 746.9 | 95% | 50% | 7% | 0.75 | 750 | 3.4 | 1,303 | 1,072 |
| | Seg Harv | 320.6 | 95% | | | | | | 474 | 255 |
| HSRG Solution w/ Improved Habitat | Int Harv | 746.9 | 95% | 50% | 5% | 0.79 | 922 | 3.9 | 1,342 | 1,072 |
| | Seg Harv | 320.6 | 95% | | | | | | 474 | 255 |

Hatchery Scientific Review Group Review and Recommendations

John Day-Middle Fork Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 John Day-Middle Fork Spring Chinook

The John Day subbasin is located in northeastern Oregon in the southern section of the Columbia Plateau Ecological Province. This approximately 5,067,500-acre (8,000 square miles) drainage area is bound by the Columbia River (Lake Umatilla) to the north, the Blue Mountains to the east, the Aldrich Mountains and Strawberry Range to the south, and the Ochoco Mountains to the west. The John Day subbasin incorporates portions of Grant, Wheeler, Gilliam, Sherman, Wasco, Jefferson, Umatilla, Morrow, Crook, Harney, Baker and Union counties (John Day Subbasin Plan 2005). The John Day River is one of the few remaining systems in Oregon with persistent anadromous fish populations unaffected by direct hatchery releases or dams. The Middle Fork John Day watershed drains 806 square miles with a perimeter of 158 miles. Watershed elevations range from 2,200 feet near the mouth of the Middle Fork to over 8,200 feet in the headwater areas. From its headwaters to its confluence with the North Fork, the Middle Fork John Day measures approximately 55 miles.

John Day spring Chinook enter the mouth of the Columbia River in February to begin the 217-mile migration upriver to the confluence of the John Day and Columbia rivers. Spring Chinook returning to the John Day typically enter the river in early July and hold in cold-water refugia until they are sexually mature and ready to spawn in late August through September (John Day Subbasin Plan 2005). After emergence in March and April, juveniles reside in downstream rearing areas for approximately 12 months before outmigrating the following spring, with migration peaking past Spray (RM 170) on the mainstem during the second week in April (Lindsay et al. 1985). In 2000, record numbers of spring Chinook salmon spawned in the index areas of the John Day River. According to unpublished data from the ODFW, a total of 477 redds were counted in the North Fork John Day that year, when in 1995 only 27 redds were tallied. In the declining Granite Creek system, 241 redds were counted, more than double the 20-year average. Spawning populations in both the mainstem and Middle Fork John Day Rivers were the highest recorded since 1959. Contributing factors probably include improved ocean conditions, success in habitat restoration (screened diversions, improved adult and juvenile fish passage, efficient irrigation, riparian cover) and improved management practices (USBR 2003).

During critical low water years, some fish may encounter passage and spawning difficulties in some upper subbasin streams. Flows necessary for migration are available most years. However, juveniles moving out of unfavorably high stream temperatures in some mainstem reaches to cooler water in tributaries are blocked from some streams because of low flows, passage barriers, irrigation demands or a combination of the three. Research studies in the John Day subbasin revealed that when mean daily stream temperatures exceed 68°F, young Chinook disappear from mainstem habitat either through escape to cooler tributaries where available, or through mortality (ODFW 1990).

All angling for salmon in the John Day subbasin has been prohibited since 1976. The Confederated Tribes of the Umatilla Indian Reservation have a limited subsistence fishery on Granite Creek and on the North Fork between Highway 395 and Big Creek (excluding tributaries). This tribal fishery has been conducted in the last decade with a variable annual quota of 100 fish or less (ODFW 1995).

The upper Middle Fork John Day River, where the Oxbow Conservation Area is located, has been identified as a high priority area in the subbasin since the early 1970s. In 2001, the Northwest Power and Conservation Council approved the Confederated Tribes of Warm Springs' proposal to purchase the property with funding from the Bonneville Power Administration. Since

then, project efforts have focused on fish and wildlife habitat protection and enhancement. Efforts include extensive tree and shrub planting, floodplain and river channel restoration, correction of fish passage problems, weed control, and irrigation usage.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Naturally spawning spring Chinook in the John Day system are included in the Middle Columbia River Spring-run Chinook ESU, which is not listed under the ESA.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette results in a designation of Primary.
- **Current Viability Rating:** Unknown.
- **Recovery Goal for Abundance:** Unknown.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity (from EDT):** Productivity: 3.5; Capacity: 1,500.

2.2 Current Hatchery Programs Affecting this Population

No spring Chinook hatchery program currently operates in the Middle Fork John Day River. Under the current scenario, pHOS is estimated at less than 1%.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from out-of-basin hatchery programs: 7 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

No spring Chinook hatchery program currently operates in the John Day River and it is estimated that spring Chinook from out-of-basin programs make less than a 1% contribution to the natural spawning populations in the basin. Given these assumptions, there would be minimal change to productivity, natural-origin spawning, or harvest for the John Day Middle Fork spring Chinook population under our No Hatchery scenario. Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase slightly from 3.0 to 3.1. Average abundance of natural-origin spawners (NOS) would increase from approximately 959 fish to approximately 983 fish. Harvest contribution of the natural population would remain unchanged at approximately 135 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Middle Fork John Day River spring Chinook population was reviewed as a Primary population. There are no hatchery programs for spring Chinook that operate in the basin, and it is estimated that out-of-basin strays make less than a 1% contribution to the natural spawning populations in the Middle Fork John Day River.

Recommendations

The HSRG recommends that this population continue to be managed for natural production as a Primary population.

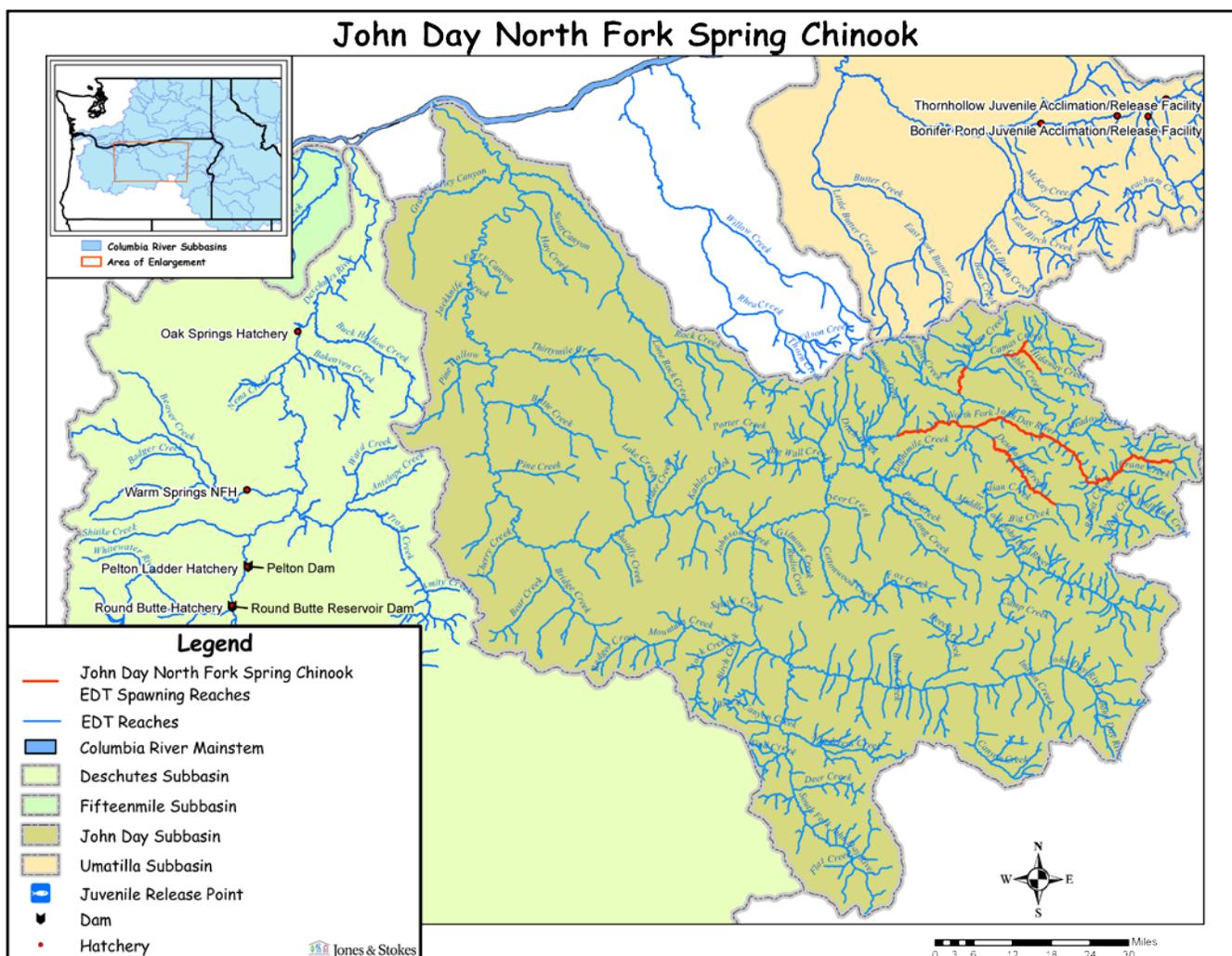
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Middle Fork John Day Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 959 | 3.0 | 134 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 983 | 3.1 | 137 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 958 | 3.0 | 134 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 1,110 | 3.3 | 155 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

John Day-North Fork Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 John Day-North Fork Spring Chinook

The John Day subbasin is located in northeastern Oregon in the southern section of the Columbia Plateau Ecological Province. This approximately 5,067,500 acre (8,000 square miles) drainage area is bound by the Columbia River (Lake Umatilla) to the north, the Blue Mountains to the east, the Aldrich Mountains and Strawberry Range to the south, and the Ochoco Mountains to the west. The John Day subbasin incorporates portions of Grant, Wheeler, Gilliam, Sherman, Wasco, Jefferson, Umatilla, Morrow, Crook, Harney, Baker and Union counties (John Day Subbasin Plan 2005). The John Day River is one of the few remaining systems in Oregon with persistent anadromous fish populations unaffected by direct hatchery releases or dams.

John Day spring Chinook enter the mouth of the Columbia River in February to begin the 217-mile migration upriver to the confluence of the John Day and Columbia rivers. Spring Chinook returning to the John Day typically enter the river in early July and hold in cold-water refugia until they are sexually mature and ready to spawn in late August through September (John Day Subbasin Plan 2005). After emergence in March and April, juveniles reside in downstream rearing areas for approximately 12 months before migrating downstream the following spring, with migration peaking past Spray (RM 170) on the mainstem during the second week in April (Lindsay et al. 1985). In 2000, record numbers of spring Chinook salmon spawned in the index areas of the John Day River. According to unpublished data from the ODFW, a total of 477 redds were counted in the North Fork John Day that year, when in 1995 only 27 redds were tallied. In the declining Granite Creek system, 241 redds were counted, more than double the 20-year average. Spawning populations in both the mainstem and Middle Fork John Day Rivers were the highest recorded since 1959. Contributing factors probably include improved ocean conditions, success in habitat restoration (screened diversions, improved adult and juvenile fish passage, efficient irrigation, riparian cover) and improved management practices (USBR 2003).

During critical low water years, some fish may encounter passage and spawning difficulties in some upper subbasin streams. Flows necessary for migration are available most years. However, juveniles moving out of unfavorably high stream temperatures in some mainstem reaches to cooler water in tributaries are blocked from some streams because of low flows, passage barriers, irrigation demands or a combination of the three. Research studies in the John Day subbasin revealed that when mean daily stream temperatures exceed 68°F, young Chinook disappear from mainstem habitat either through escape to cooler tributaries where available or through mortality (ODFW 1990).

All angling for salmon in the John Day subbasin has been prohibited since 1976. The Confederated Tribes of the Umatilla Indian Reservation have a limited subsistence fishery on Granite Creek and on the North Fork between Highway 395 and Big Creek (excluding tributaries). This tribal fishery has been conducted in the last decade with a variable annual quota of 100 fish or less (ODFW 1995).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Naturally spawning spring Chinook in the John Day system are included in the Middle Columbia River Spring-run Chinook ESU, which is not listed under the ESA.

- Population Designation: Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette results in a designation of Primary.
- Current Viability Rating: Unknown.
- Recovery Goal for Abundance: Unknown.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (from EDT): Productivity: 5.2, Capacity: 3,000.

2.2 Current Hatchery Programs Affecting this Population

No spring Chinook hatchery program currently operates in the John Day River and it is estimated that spring Chinook from out-of-basin programs make less than a 1 % contribution to the natural spawning populations in the North Fork John Day River.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

No spring Chinook hatchery program currently operates in the John Day River and it is estimated that spring Chinook from out-of-basin programs make less than a 1% contribution to the natural spawning populations in the North Fork John Day River. Given these assumptions, there would be minimal changes to productivity, natural-origin spawning, or harvest for the John Day North Fork spring Chinook population under our No Hatchery scenario. Our analysis estimated

adjusted productivity (with harvest and fitness factor effects from AHA) would remain unchanged at 4.5. Average abundance of natural-origin spawners (NOS) and harvest contribution from the natural population would also remain unchanged at approximately 2250 fish and approximately 340 fish, respectively.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The North Fork John Day River spring Chinook population was reviewed as a Primary population. There are no hatchery programs for spring Chinook that operate in the basin, and it is estimated that out-of-basin strays contribute less than 1% to the natural spawning populations in the North Fork John Day River.

Recommendations

The HSRG recommends that this population continue to be managed for natural production as a Primary population.

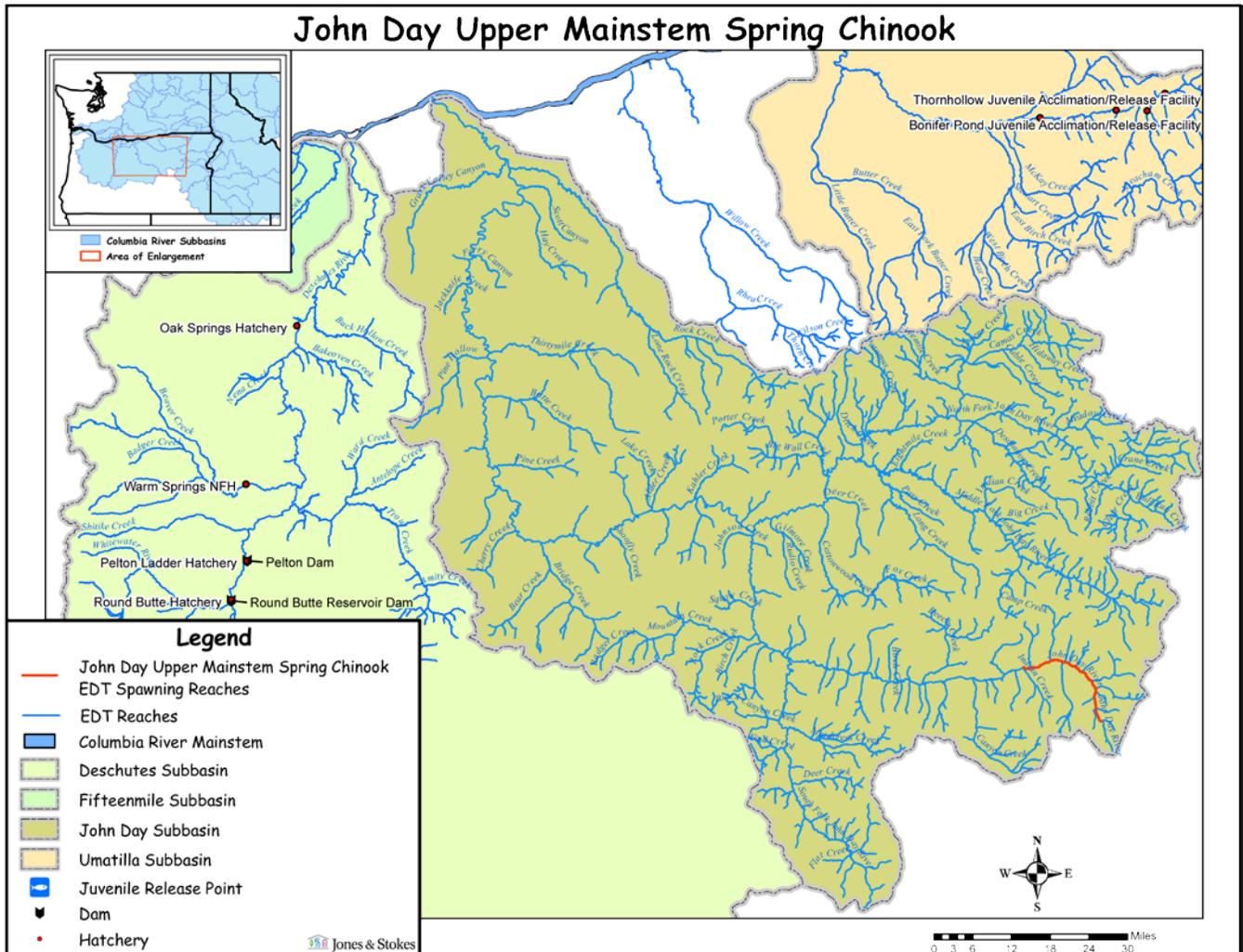
Table 1. Results of HSRG analysis of current conditions and HSRG solution for John Day North Fork Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 2,243 | 4.5 | 339 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 2,256 | 4.5 | 341 | - |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 2,243 | 4.5 | 339 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 2,535 | 4.9 | 383 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

John Day-Upper Mainstem Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 John Day-Upper Mainstem Spring Chinook

The John Day subbasin is located in northeastern Oregon in the southern section of the Columbia Plateau Ecological Province. This approximately 5,067,500-acre (8,000 square miles) drainage area is bound by the Columbia River (Lake Umatilla) to the north, the Blue Mountains to the east, the Aldrich Mountains and Strawberry Range to the south, and the Ochoco Mountains to the west. The John Day subbasin incorporates portions of Grant, Wheeler, Gilliam, Sherman, Wasco, Jefferson, Umatilla, Morrow, Crook, Harney, Baker and Union counties (John Day Subbasin Plan 2005). The John Day is one of the few remaining systems in Oregon with persistent anadromous fish populations unaffected by direct hatchery releases or dams.

John Day spring Chinook enter the Columbia River in February to begin the 217-mile migration upriver to the confluence with the John Day. Spring Chinook returning to the John Day typically enter the river in early July and hold in cold-water refugia until they are sexually mature and ready to spawn in late August through September (John Day Subbasin Plan 2005). After emergence in March and April, juveniles reside in downstream rearing areas for approximately 12 months before migrating downstream the following spring, with migration peaking past Spray (RM 170) on the mainstem John Day during the second week in April (Lindsay et al. 1985). In 2000, record numbers of spring Chinook salmon spawned in the index areas of the John Day River. According to unpublished data from the ODFW, a total of 477 redds were counted in the North Fork John Day that year, when in 1995 only 27 redds were tallied. In the declining Granite Creek system, 241 redds were counted, more than double the 20-year average. Spawning populations in both the mainstem and Middle Fork John Day Rivers were the highest recorded since 1959. Contributing factors probably include improved ocean conditions, successful habitat restoration (screened diversions, improved adult and juvenile fish passage, efficient irrigation, and riparian cover) and improved management practices (USBR 2003).

During critical low water years, some fish may encounter passage and spawning difficulties in some upper subbasin streams. Flows necessary for migration are available most years. However, juveniles moving out of unfavorably high stream temperatures in some mainstem reaches to cooler water in tributaries are blocked from some of these streams because of low flows, passage barriers, irrigation demands or a combination of the three. Studies in the John Day subbasin revealed that when mean daily stream temperatures exceed 68°F, young Chinook disappear from mainstem habitat either through escape to cooler tributaries (where available) or through mortality (ODFW 1990).

As many as 1,500 adult spring Chinook salmon return each year to the Upper Mainstem John Day subbasin to spawn. The subbasin produces about 23% of the total John Day spring Chinook over approximately 15.5 miles of spawning and rearing habitat. As habitat conditions in the Upper Mainstem John Day River continue to improve, it is likely that the extent of spring Chinook spawning and rearing will expand farther downstream (ODA 2002).

All salmon angling in the John Day subbasin has been prohibited since 1976. The Confederated Tribes of the Umatilla Indian Reservation have a limited subsistence fishery on Granite Creek (tributary to the North Fork) and on the North Fork between Highway 395 and Big Creek (excluding tributaries). This tribal fishery has been conducted in the last decade with a variable annual quota of 100 fish or less (ODFW 1995).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Naturally spawning spring Chinook in the John Day system are included in the Middle Columbia River Spring-run Chinook ESU, which is not listed under the ESA.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette results in a designation of Contributing.
- **Current Viability Rating:** Unknown.
- **Recovery Goal for Abundance:** Unknown.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity (from EDT):** Productivity: 4.0; Capacity: 1,500.

2.2 Current Hatchery Programs Affecting this Population

No spring Chinook hatchery program currently operates in the John Day River and it is estimated that spring Chinook from out-of-basin programs make less than a 1 % contribution to the natural spawning populations in the Upper Mainstem John Day River.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

No spring Chinook hatchery program currently operates in the John Day River and it is estimated that spring Chinook from out-of-basin programs make less than a 1% contribution to the natural spawning populations in the Upper Mainstem John Day River. Given these assumptions, there would be minimal change to productivity, natural-origin spawning, or harvest for the Upper Mainstem John Day spring Chinook population under our No Hatchery scenario. Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase slightly from 3.4 to 3.5. Average abundance of natural-origin spawners (NOS) and the harvest contribution of the natural population would remain unchanged at approximately 1030 fish and 145 fish, respectively. Harvest contribution of the natural and hatchery populations would go from approximately 140 fish to approximately 145 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Upper Mainstem John Day River spring Chinook population was reviewed as a Primary population. There are no hatchery programs for spring Chinook that operate in this basin. Out-of-basin strays are estimated to make up less than 1% of the natural spawning population.

Recommendations

The HSRG recommends that this population be managed for natural production as a Primary population.

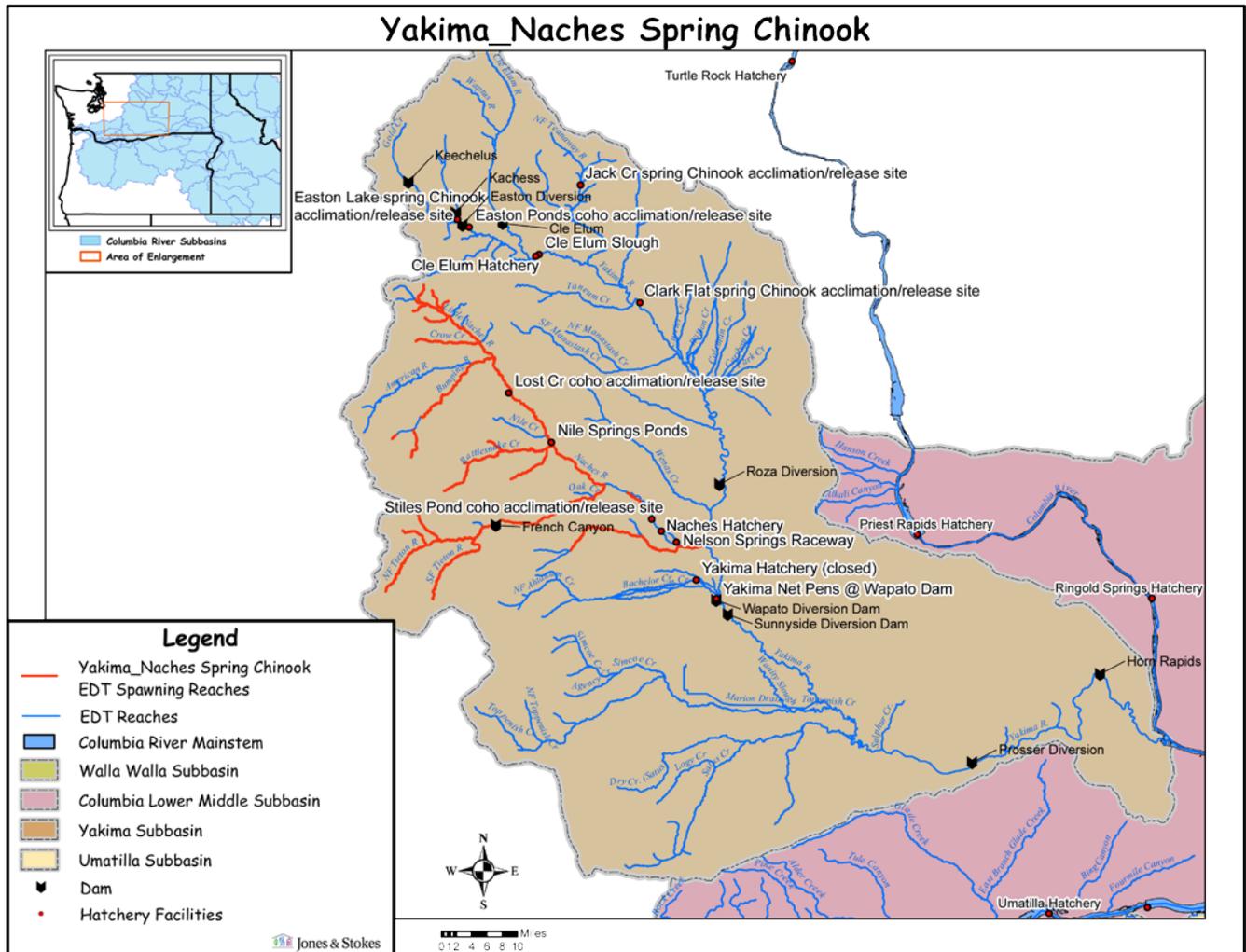
Table 1. Results of HSRG analysis of current conditions and HSRG solution for John Day Upper Mainstem Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 1,023 | 3.4 | 143 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,044 | 3.5 | 146 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 1,022 | 3.4 | 143 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 0.00 | 1,173 | 3.8 | 164 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Naches Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Naches Spring Chinook

The Yakima subbasin supports three genetically and demographically distinct stocks of spring Chinook: the American River stock (numerically smallest), the Naches River stock (numerically intermediate) and the upper Yakima stock (numerically largest). Estimates of the size of historical Yakima spring Chinook returns (all stocks) range from approximately 50,000 (Kreeger and McNeil 1993) to 200,000 (Yakima Subbasin Plan 1990). Currently, about 27% of Yakima spring Chinook are Naches stock. If current and historical stock composition is similar, the historical Naches population may have been as small as 13,500 or as large as 54,000. From 1981 to 2007, escapement to the Naches has ranged from 86 to 3,914 fish, with a mean of 447. No hatchery-reared spring Chinook have been released in the Naches River since 1987. Like the upper Yakima stock, returns and escapements have increased markedly since 2000. Mean escapement for the period 1981 to 1999 was 798; for the period 2000 to 2007, mean escapement was 2,037 (Bill Bosch, Yakama Nation, personal communication, 2007). Although the first spring Chinook returns from the Cle Elum Supplementation and Research Facility (CESRF) occurred in 2000 (jacks) and 2001 (adults), no marked CESRF fish have been recovered during intensive spawning surveys in the Naches watershed (Dave Fast, Yakama Nation, personal communication, 2007).

Since 1982, in-basin harvest of NORs has ranged from 25 to 2,305, with a mean of 608. Assuming harvest is proportional to the mean relative abundance of Yakima spring Chinook stocks, the mean annual harvest of Upper Yakima, Naches and American River NORs has been 365, 163 and 79, respectively. All of the Naches and American River fish were taken in the non-selective tribal fishery.

Spawning reaches shown in the map represents the likely historic range of spring Chinook in the Naches watershed. Dams in the Tieton and Bumping rivers do not have fish ladders. Spring Chinook spawning occurs in the mainstem Naches from the confluence of the Tieton River (RM 17.5) to the confluence of the Little Naches and Bumping Rivers (RM 44.6), as well as in Rattlesnake Creek, the Little Naches River and its tributaries, and in the Bumping River downstream of the reservoir. Spring Chinook spawning generally occurs from early September through early October (Yakima Subbasin Plan).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Native Naches Spring Chinook are part of the Middle Columbia Spring-run Chinook ESU, which NOAA has determined does not warrant listing under the ESA at this time.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette results in a designation of Primary.
- **Current Viability Rating:** Unknown; SaSSI rates as depressed.
- **Recovery Goal for Abundance:** NA, because not listed.
- **Productivity Improvement Expectation:** 1.2 to 1.3 (C. Frederickson, Yakama Nation, personal communication).
- **Habitat Productivity and Capacity (from EDT):** Productivity: 2.61; Capacity: 2,121.

2.2 Current Hatchery Programs Affecting this Population

Although no hatcheries, including the CESRF hatchery in the upper Yakima, release spring Chinook into the Naches River, releases of non-native hatchery smolts (primarily of Carson stock) were made between 1959 and 1987 (Yakima Subbasin Summary). The degree of introgression between Naches and outplanted stocks is not known, but is likely minimal because most of the releases were made in the upper Yakima, and because Naches and upper Yakima stocks are genetically and demographically quite different (Yakima Subbasin Summary). To date, no marked CESRF HORs have been recovered in the Naches watershed (Dave Fast, Yakama Nation, personal communication, 2007).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 17 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 2.7 to 2.9. Average abundance of natural-origin spawners (NOS) would increase from 1,609 to 1,698. Harvest contribution of the natural and hatchery populations would go from 514 to 543.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager’s goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations Box is not yellow?

The Naches spring Chinook is an intermediate sized primary population with a pHOS of <5%. This population is used as a control stream for the upper Yakima hatchery research program. Since 2000, only 7 adipose-clipped fish have been recovered from the Naches watershed. There are no adult or smolt monitoring facilities on the Naches. Recent DNA work on smolts at Prosser allows some estimation of smolt production from the three populations of spring Chinook in the Yakima.

Recommendations

The HSRG recommends that managers continue to monitor the Naches population of spring Chinook. Develop adult monitoring facilities in the lower Naches. Increase carcass monitoring to refine estimates of out-of-basin straying into the Naches. Continue to work with the Bureau of Reclamation to restore more normative flows to the Naches and upper Yakima.

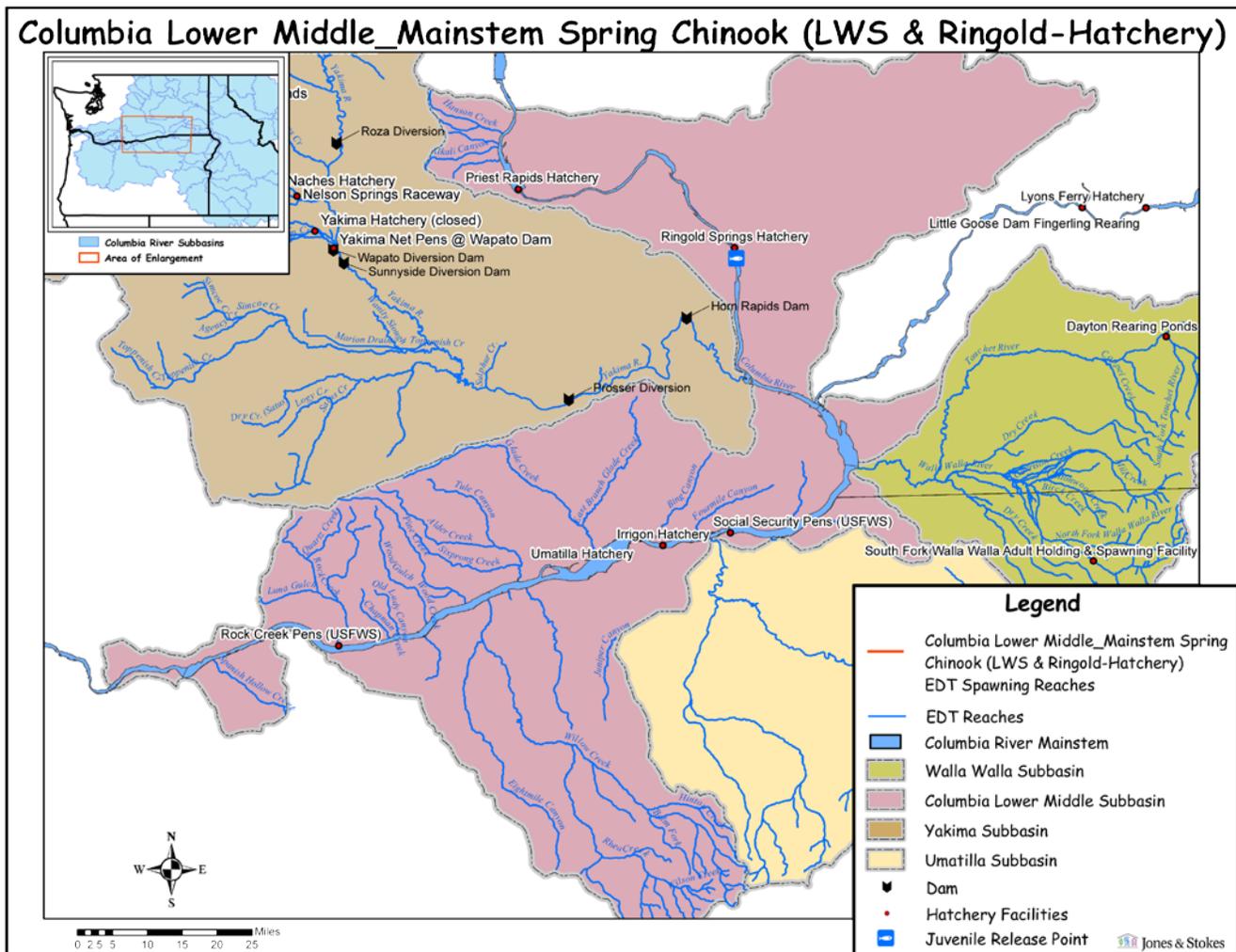
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Naches Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 1,609 | 2.7 | 514 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,698 | 2.9 | 543 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 1,618 | 2.7 | 517 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 1,894 | 3.1 | 605 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Columbia Ringold Hatchery Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Ringold Hatchery Spring Chinook

This is a segregated hatchery program and does not have an associated natural population.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Not listed. NMFS (1999) does not consider the Carson National Fish Hatchery spring-run Chinook stock listed or as part of the Upper Columbia River spring-run Chinook salmon ESU.
- Population Designation: NA.
- Current Viability Rating: NA.
- Recovery Goal for Abundance: NA.
- Productivity Improvement Expectation: NA.
- Habitat Productivity and Capacity (from EDT): NA.

2.2 Current Hatchery Programs Affecting this Population

The Ringold spring Chinook program is a segregated harvest program that is based on Columbia River spring Chinook Carson stock. The purpose of this program is to produce Chinook salmon that contribute to treaty Indian and non-Indian sport and commercial fisheries to mitigate for losses associated with the federal Columbia River hydropower system and habitat degradation in the Columbia River Basin. This program is to release up to 500,000 yearling spring Chinook salmon smolts.

Initially built as part of the Columbia River Fisheries Development Program, Ringold Springs was originally used in conjunction with the Lyons Ferry Fish Hatchery as part of the Lower Snake River Compensation Plan (LSRCP) on the Snake River to rear 1.1 million spring Chinook salmon. Funding was provided by NOAA Fisheries via the annual Mitchell Act budget for Columbia River hatchery fish production. In 1999, Mitchell Act funding was terminated for spring Chinook production and the last brood year (1998) was released prematurely in January 2000.

Ringold Springs began operation in 1962 with releases starting in 1963. A funding hiatus due to the loss of federal monies suspended spring Chinook production at Ringold with the 1982 brood (released in 1984). This spring Chinook production program has been started and stopped several times since then. Recently it was restarted and smolts are scheduled for release in 2008.

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) funded a 500,000-spring Chinook program using stock from the Little White Salmon National Fish Hatchery (NFH) for release at Ringold Springs Hatchery (a WDFW facility) as a way to reestablish a source of spring Chinook adults for harvest and reintroduction strategies. The last return of age 4 adults occurred in 2002, providing a sport harvest of about 200 fish and an additional 212 adult fish for the CTUIR to release into the South Fork Walla Walla. In 2003, 21 (presumed to be 5-year fish) were transferred to the CTUIR for release into the Walla Walla.

No adult spawning or incubation is currently possible at this facility, due to high water temperatures, making it dependant on other hatcheries for egg take and early rearing. Broodstock for this program are collected at Little White Salmon NFH, where typically, broodstock collection requires up to 1,500 adults. To facilitate another 500,000 fish for transfer to Ringold Hatchery, approximately another 250 spawning adults are needed. Little White Salmon NFH is situated just above Drano Lake, a water body through which the Little White Salmon flows before joining the Columbia River at RM 162. Adults are spawned and juveniles reared until they are transferred as fingerlings to Ringold Hatchery for release as yearling smolts. Ringold Hatchery is located at RM 352 of the mainstem Columbia River.

From 1995 to 2000, the number of fish released has ranged from 390,000 to slightly over 1.1 million yearling smolts. Releases in the late 1990s averaged about 400,000 fish. Fish were not released from 2001 to 2004. Releases have begun again using a variety of brood sources including Entiat NFH. Survival rates of Ringold spring Chinook are reported to be low (2005 HGMP), ranging from 0.07% to 0.19% in 1993 to 1997. Currently there is no funding for the continuation of this program; 2011 will be the last year for spring Chinook returns for this program unless funding is restored.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: NA

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects.

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would remain at zero. Average abundance of natural-origin spawners (NOS) would remain at zero. Harvest contribution of the natural and hatchery populations would go from 160 to 0.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The purpose of this hatchery program is to provide harvest. The program is maintained from out-of-basin broodstock imported from other hatcheries. There appears to be little opportunity for genetic interaction between this segregated harvest program and natural spawning stocks.

Broodstock collection potential appears to be adequate for the needs for this program and better than for fall Chinook. In some years, predation and disease have resulted in high mortality in this program. Currently there is no funding for the continuation of this program; 2011 will be the last year for spring Chinook returns for this program unless funding is restored.

Recommendations

Transition to the use of local broodstock derived from returns to the Ringold facility. This would require facility upgrades to allow for adult collection, handling, holding, incubation and rearing.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-

disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

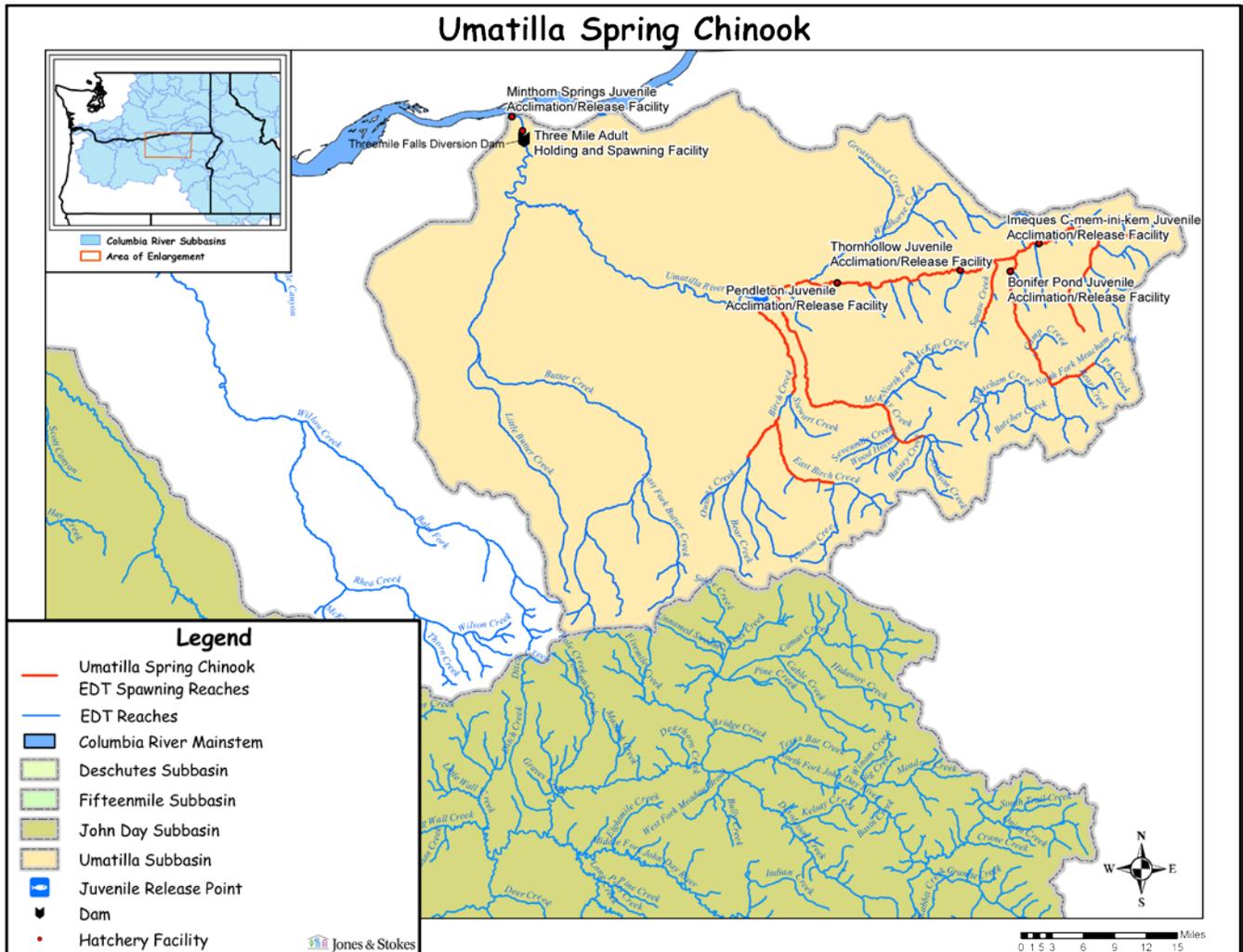
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Ringold Hatchery Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 487.1 | 70% | | | | | | 160 | 504 |
| No Hatchery | None None | - | 0% | 0% | 0% | 0.00 | 0 | 0.0 | - | - |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 486.8 | 70% | | | | | | 160 | 144 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 486.8 | 70% | | | | | | 160 | 144 |

Hatchery Scientific Review Group Review and Recommendations

Umatilla Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Umatilla Spring Chinook

The Umatilla/Willow subbasin is a 3,714-square-mile area in northeastern Oregon, situated primarily in Umatilla and Morrow Counties, with a small portion extending into Union County. The Umatilla/Willow subbasin is composed of four drainages: the Umatilla subbasin, the Willow Creek subbasin, the Six-Mile Canyon drainage, and the Juniper Canyon drainage. The mainstem Umatilla River is 89 miles long and the river and its tributaries drain an area of nearly 2,290 square miles. Willow Creek is 79 miles long and drains an area of about 880 square miles. The Six-Mile Canyon area, which contains intermittent streams that rarely drain into the Columbia River, is 472 square miles. The mainstem of Juniper Canyon Creek is 19 miles long and drains 72 square miles (Umatilla Subbasin Plan 2004).

Habitat degradation due to agricultural water withdrawal, construction of Three Mile Dam, and forest management practices led to the extirpation of salmon from the Umatilla subbasin in the early 1900s (Umatilla Subbasin Plan 2004).

Carson stock spring Chinook from the Little White Salmon Hatchery were used to begin reintroduction efforts in 1986. Attempts have been made to count adult returns since 1988. Average adult returns between 1988 and 2002 were 1,968 with an apparent upward trend in returns. Only 23 to 348 naturally-produced adults returned to the basin between 1988 and 2004, with hatchery-origin returns forming the bulk of the adult returns. The productivity of the spring Chinook population appeared to be increasing over the years 1991 to 2002, based on the number of redds and the number of spawned-out female carcasses. However, from 1992 to 1997, the population was below replacement every year except one (1992), based on the number of adults returning per spawner. Current spawning distribution is much smaller than the estimated historic distribution. The current distribution is limited to the upper mainstem, the North Fork Umatilla, and Meacham Creek. The historic distribution included the middle mainstem and McKay, Birch, and Butter Creeks.

Beginning in 1998, the majority of the broodstock has come from adults returning to the Umatilla River. As a result of the hatchery program, returns of spring Chinook have been large enough to support a sport and tribal harvest in 10 of the last 13 years (Umatilla Subbasin Plan 2004).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Naturally spawning spring Chinook in the Umatilla system are the result of hatchery plants and are not included in any ESU nor listed under the ESA.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette results in a designation of Contributing.
- **Current Viability Rating:** Unknown.
- **Abundance Goals from Umatilla Hatchery Master Plan (1989):** 1,000 wild adults.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity (from EDT):** Productivity: 2.42; Capacity: 942.

2.2 Current Hatchery Programs Affecting this Population

An integrated hatchery program operates in the Umatilla, rearing Carson stock spring Chinook. This program originally operated with the intent of reintroducing spring Chinook to the subbasin. Now that adult returns to the Umatilla are supporting the hatchery program, it is operating with the objective of supporting harvest opportunities.

From brood years 1984 to 1999, Carson stock adults were collected from various sources (Cascade National Fish Hatchery [NFH], Lookingglass Hatchery, Big Canyon Hatchery, Ringold Hatchery, Little White Salmon NFH, and from adult returns to the Umatilla River). Since 2000, all spring Chinook salmon broodstock have been collected from the Umatilla River.

The goal of this program is to collect 588 adults (5% jack component) at Three Mile Falls Dam to hold at the South Fork Walla Walla holding facility until ripe. Spawning at the facility typically occurs from mid-August through September. Spawning occurs weekly and mating is 1:1. Fertilized eggs are transferred to the Umatilla Hatchery for incubation. At the eyed stage, approximately 400,000 eyed eggs are transferred to the Little White Salmon NFH where they complete their rearing. The remaining eggs (approximately 1,000,000) complete their incubation and rearing at the Umatilla Hatchery.

From the Umatilla Hatchery, 600,000 yearlings are transported to the Imeques Acclimation Site at Umatilla RM 80 in late February or early March, where they are acclimated for 3 weeks and volitionally released in mid-March at approximately 15 fpp. In addition, 210,000 yearlings from the Little White Salmon NFH are transported to the Imeques Acclimation Site in late March or early April, where they too are acclimated for 3 weeks and volitionally released in mid-April at approximately 15 fpp.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 3,387 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 60 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 1.1 to 1.9. Average abundance of natural-origin spawners (NOS) would decrease from approximately 480 fish to approximately 367 fish. Harvest contribution of the natural and hatchery populations would go from approximately 2,408 fish to approximately 110 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified two goals for this population: one is to establish a natural sustainable population and the other is to provide harvest opportunities.

On one hand, current habitat quality and quantity is limited in this basin, as evidenced by the extirpation of the population. This condition limits opportunities for successful establishment of a natural self-sustaining population. On the other hand, because of passage improvements and collection facilities at Three Mile Dam, it is possible to monitor and manage broodstock spawning composition that may increase the likelihood of developing a small locally adapted naturally spawning population that would benefit from on-going and proposed habitat improvements.

As currently operated, this program is making no progress toward establishing a sustainable natural population. The continual high proportion of hatchery spawners from the current hatchery program (with a PNI less than 0.1) allows no opportunity for the population to adapt to the local environment. A PNI greater than 0.5 is necessary for the natural environment to drive adaptation and increase fitness.

Without significant habitat improvements, the natural-origin population will remain relatively small. It is unlikely that this stock could meet the abundance guidelines for a Primary population.

Recommendations

To meet the management goal of developing a sustainable natural population while maintaining harvest benefits, we recommend that hatchery broodstock be managed in the following ways. Develop a two-stage stepping stone program to support the natural population and to provide harvest. The program would consist of an integrated conservation component producing approximately 250,000 smolts. This component would initially be produced from 100% natural-origin broodstock, but subsequent generations would be maintained by collecting 60% natural-origin broodstock and 40% hatchery-origin returns from this component. Excess hatchery-origin returns from the conservation component would provide all broodstock to maintain an additional second stage harvest component of approximately 560,000 smolts. Unharvested hatchery returns from the harvest component would not be used for broodstock. This would require differential marking of juveniles from the two programs. For example, the juveniles from the conservation program would be coded-wire tagged only, while the harvest program fish would be adipose-marked and partially coded-wire tagged.

In order to assure optimal distribution of naturally spawning fish, juveniles from the conservation program should be acclimated and released in the upper watershed nearer primary spawning habitat. This may require development of a new site further up in the watershed. Managers should also consider trucking adults returning to Three Mile Dam from the conservation program and natural-origin adults to the spawning grounds.

Juveniles from the harvest program should be acclimated and released as currently occurs.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

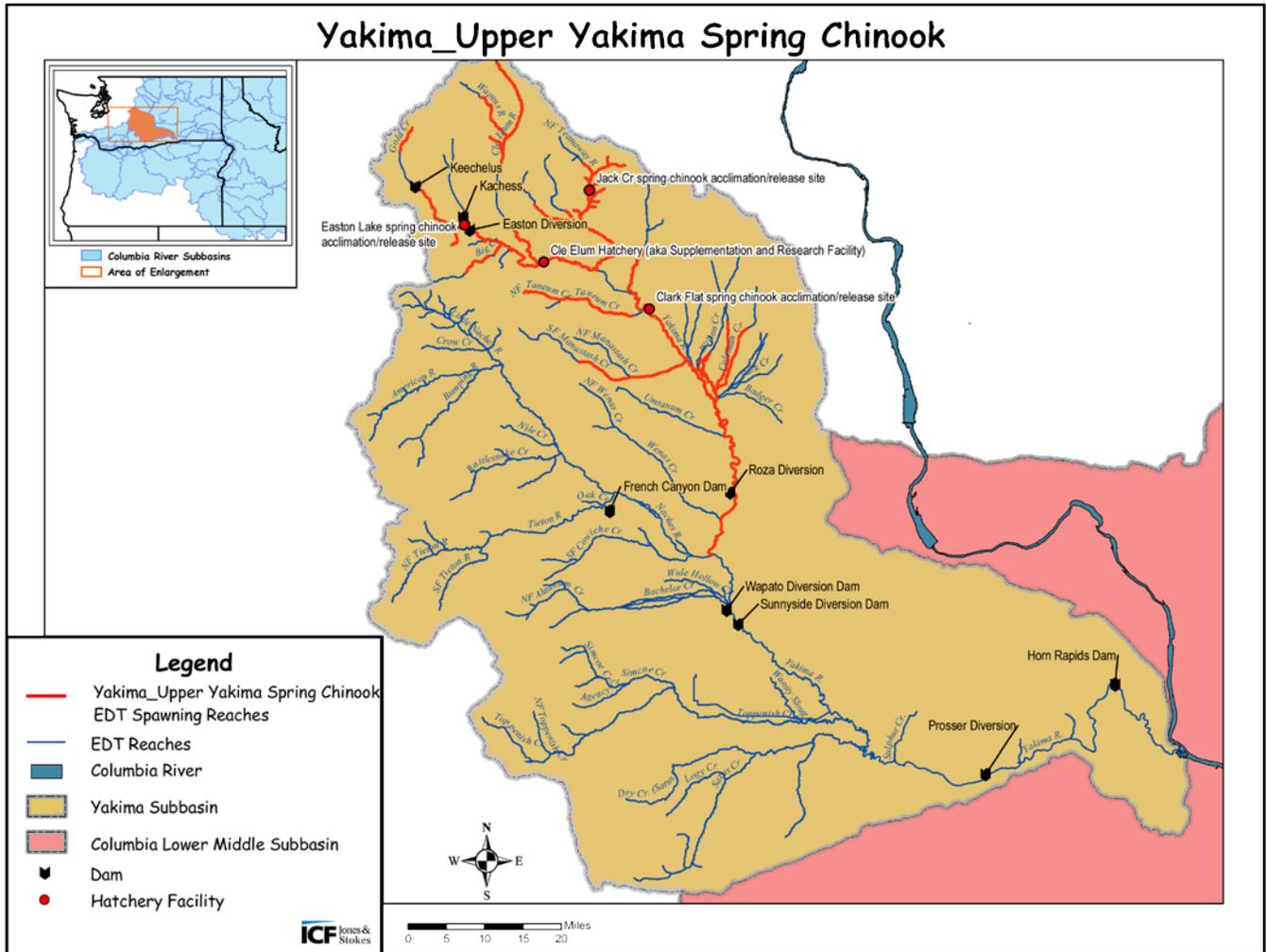
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Umatilla Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|----------------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 925.2 | 20% | 0% | 85% | 0.07 | 480 | 1.1 | 2,408 | 253 |
| | Stepping Stone Hatchery Seg Harv | - | 20% | | | | | | - | - |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 367 | 1.9 | 110 | - |
| HSRG Solution | Int Cons | 277.6 | 60% | 0% | 57% | 0.51 | 335 | 1.5 | 812 | 249 |
| | Stepping Stone Hatchery Seg Harv | 562.2 | 20% | | | | | | 1,369 | 515 |
| HSRG Solution w/ Improved Habitat | Int Both | 277.6 | 60% | 0% | 52% | 0.53 | 401 | 1.7 | 832 | 249 |
| | Stepping Stone Hatchery Seg Harv | 562.2 | 20% | | | | | | 1,369 | 515 |

Hatchery Scientific Review Group Review and Recommendations

Upper Yakima Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Upper Yakima Spring Chinook

The Yakima subbasin supports three genetically and demographically distinct stocks of spring Chinook: the American River stock (numerically smallest), the Naches River stock (numerically intermediate) and the upper Yakima stock (numerically largest). Estimates of the size of historical Yakima spring Chinook returns (all stocks) range from approximately 50,000 (Kreeger and McNeil 1993) to 200,000 (Yakima Subbasin Plan 1990). Currently, about 60% of Yakima spring Chinook are upper Yakima stock. If current and historical stock composition is similar, the historical upper Yakima population may have been as small as 30,000 or as large as 120,000. From 1982 to 2007, NOR escapement to the upper Yakima ranged from 355 to 10,972 fish, with a mean of 3,231. The escapement of natural-origin fish in the upper Yakima has increased substantially since 2000. Mean escapement from 1982 to 1999 was 1,569; mean escapement from 2000 to 2007 was 4,126. The first return of 4-year-old hatchery adults was in 2001 from the Cle Elum Supplementation and Research Facility (CESRF) (Bill Bosch, Yakama Nation, personal communication, 2007).

A non-Mitchell Act spring Chinook hatchery in the upper Yakima subbasin, the CESRF began operation in 1997. The hatchery is located near the town of Cle Elum at RM 184. From 2001 (year of the first return of adults) through 2007, total HOR spawning escapement ranged from 1,109 to 7,047, with a mean of 3,244 fish. Over this same period, the proportion of hatchery fish in the natural spawning escapement has ranged from 19.5% to 76.3%, with a mean of 52.3%.

From 1982 to 2007, in-basin harvest of NORs ranged from 25 to 2,806, with a mean of 648 fish. Since 2001, in-basin harvest of HORs ranged from 12 to 1,865, with a mean of 659. Sport harvest is selective, but tribal harvest is not.

Spawning reaches shown in the map represents the likely historic range of spring Chinook in the upper Yakima subbasin. Dams in the upper Yakima River and Cle Elum River do not have fish ladders. Spring Chinook spawning currently occurs in the mainstem Yakima from just below Roza Dam (RM 128) to Keechelus Dam (RM 214), but is concentrated between the Cle Elum River confluence (RM 186) and Easton Dam (RM 202). Substantial spawning also occurs in two larger tributaries, the Teanaway River (confluence at RM 176 of the Yakima River) and the Cle Elum River (confluence at RM 186 of the Yakima River) downstream of Cle Elum reservoir. Spring Chinook spawning generally occurs from early September through early October (Yakima Subbasin Plan).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Native upper Yakima Spring Chinook are part of the Middle Columbia Spring-run Chinook ESU, which NOAA determined does not warrant listing under the ESA at this time.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette results in a designation of Primary.
- **Current Viability Rating:** Unknown.
- **Recovery Goal for Abundance:** NA, because not listed.

- Productivity Improvement Expectation: 1.06 to 1.16 (C. Frederickson, Yakama Nation, personal communication).
- Habitat Productivity and Capacity (from EDT): Productivity 3.28; Capacity 5,292.

2.2 Current Hatchery Programs Affecting this Population

Upper Yakima spring Chinook are endemic to the watershed, but between 1959 and 1987, numerous releases of non-native hatchery smolts (primarily Carson stock) occurred (Yakima Subbasin Summary). Busack et al. (1991) conducted an electrophoretic genetic stock analysis of Yakima spring Chinook. Regarding Carson/upper Yakima introgression, they state:

“Hatchery influence is to be expected in the upper Yakima, and the observed electrophoretic clustering of the Carson and upper Yakima stocks may reflect this, although it is unknown how similar the stocks were before the hatchery operations began.”

The CESRF has been producing spring Chinook for conservation and harvest since 1997 (first releases were in 1999). The program uses only unclipped natural-origin fish for broodstock, except for an experimental, segregated hatchery line which uses only clipped, hatchery-reared fish. Although full production is 810,000 (720,000 yearling smolts from NOR x NOR crosses and 90,000 smolts from HOR x HOR crosses), an average of only 694,000 smolts have been released through brood year 2005 (release year 2007). The average number of NOR broodstock collected through the 2007 brood was 510 fish. Broodstock is randomly collected over the entire return at the Roza Dam Adult Collection Facility and includes jacks. The only way for fish to move beyond Roza Dam is to pass through the ladder and adult facility. Except for HOR x HOR crosses, fish not needed for broodstock pass freely above Roza Dam. All HOR x HOR fish not needed for broodstock are removed to preclude natural spawning. A maximum of 50% of the natural return may be taken for broodstock. Except for exclusion of HOR x HOR progeny, the contribution of hatchery fish (NOR x NOR) to natural spawning escapement is not controlled.

Fish are transferred from the CESRF to three acclimation ponds in January or February. The ponds are located at two sites on the upper Yakima mainstem, at Clark Flat (RM 168) and Easton (RM 202), as well as on the North Fork Teanaway River (RM 5.6), an upper Yakima tributary. Beginning March 15, fish are volitionally released from all acclimation ponds. All fish are coded-wire tagged, (snout) and adipose fin-clipped, and HOR x HOR fish are differentially marked (coded-wire tag placed in posterior dorsal fin). Fish are also marked with fluorescent elastomer implants, and a subset is also PIT-tagged to facilitate estimation of outmigration and survival rates. Outlet channels from the acclimation ponds to the river are equipped with PIT-tag detectors. Through release year 2001, size at release ranged from 15 to 18 fish per pound, but release size (and growth profile) is now being experimentally manipulated and fish are somewhat smaller (22.7 fish per pound for the 2002 release (HGMP)). Previous experiments indicated that the SAR for fish subject to semi-natural rearing and exposure to predators did not significantly differ from fish that had been conventionally reared (Fast et al. *in press*). Experimental treatments now focus on reducing the incidence of precocialism through manipulation of the growth profile.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 3,053 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: NA.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 2.4 to 2.7. Average abundance of natural-origin spawners (NOS) would increase from 2,873 to 3,005. Harvest contribution of the natural and hatchery populations would go from 2,402 to 956.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This ESU is not listed under the ESA, but this population would meet the standards of a Primary population in the context of an ESU.

This population has experienced highly variable returns with poor survival in some years, resulting in low natural spawner abundance. In low-abundance years, the hatchery program provides a demographic buffer.

Research related to the effect of broodstock management and natural production is an important objective of this program. Facilities were designed and constructed to support long-term research projects. A spawning channel supports research on reproductive success of hatchery and natural adults.

Roza Dam provides an opportunity to manage broodstock composition in the hatchery and on the spawning grounds.

This is a well-run integrated program that provides harvest, addresses important research questions and conservation benefits. A segregated program would provide similar harvest opportunities but would not meet the research or conservation objectives.

Recommendations

This integrated hatchery program should be continued and also should continue to provide research on topics of importance to the Columbia River Basin.

The managers should pursue opportunities to increase harvest of hatchery fish. This would also contribute to conservation benefits by reducing pHOS, thus improving fitness. The challenge is to achieve this increased harvest of hatchery fish with minimal impact on natural populations in the basin. In the event that additional harvest is not possible under these circumstances, the managers could consider removing additional hatchery fish at Roza Dam to achieve a conservation benefit.

The HSRG recommends that managers continue the BKD culling program at the Cle Elum facility, and implement a BKD control strategy for other spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

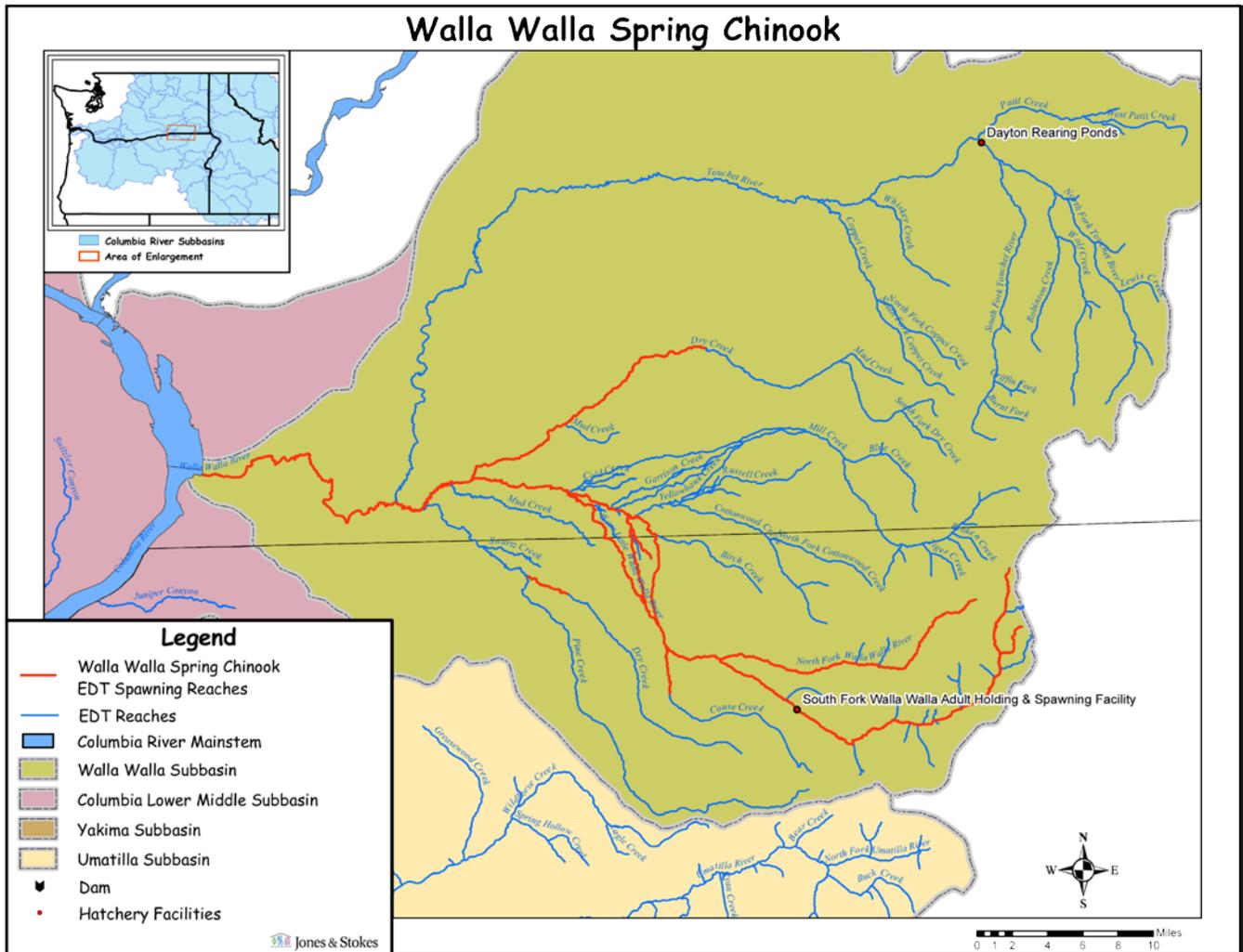
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Upper Yakima Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 810.7 | 5% | 0% | 47% | 0.68 | 2,873 | 2.4 | 2,402 | 161 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 3,005 | 2.7 | 956 | - |
| HSRG Solution | Int Both | 810.7 | 5% | 0% | 47% | 0.68 | 2,871 | 2.4 | 2,414 | 161 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Both | 810.7 | 5% | 0% | 44% | 0.69 | 3,304 | 2.7 | 2,552 | 161 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Walla Walla River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



Note: Spawning reaches likely vary from those depicted.

1 Walla Walla River Spring Chinook

Walla Walla spring Chinook were extirpated early in the 20th century. The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) has developed a reintroduction plan for spring Chinook. This plan includes the release of hatchery adults from nearby hatchery programs and recently the release of Carson or Walla Walla stock hatchery smolts into the South Fork Walla Walla. The purpose of the Walla Walla program is to help mitigate for fish losses in the Columbia River Basin associated with development of the federal Columbia River hydropower system and other basin development.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Population extirpated, part of the Middle Columbia River Spring-run Chinook ESU.
- Population Designation: Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette results in a designation of Primary.
- Current Viability Rating: Extirpated.
- Recovery Goal for Abundance: Unknown.
- Productivity Improvement Expectation: 1.2 to 1.4 (CTUIR pers. communication).
- Habitat Productivity and Capacity (from EDT): Productivity: 4.0; Capacity: 443.

2.2 Current Hatchery Programs Affecting this Population

The current reintroduction program is based on Carson stock collected from either the Little White Salmon or Carson National Fish Hatchery. In recent years, sufficient fish have been available from the Umatilla spring Chinook program to release into the Walla Walla. The proposed annual release level is 250,000 smolts to be released in the South Fork Walla Walla River (RM 7) (2005 HGMP). Program releases first occurred in 2005 from brood year 2003 fish. Before 2003, spring chinook adults collected from Ringold Hatchery were released into the Walla Walla.

The CTUIR has proposed to develop an integrated recovery program using broodstock collected from the Walla Walla River.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 719 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 39 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For

integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 1.8 to 3.5. Average abundance of natural-origin spawners (NOS) would increase from 261 to 316. Harvest contribution of the natural and hatchery populations would go from 190 to 42.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Native spring Chinook were extirpated. This is a reintroduction program. Initially, the benchmarks for PNI and pHOS are not attainable. Under current habitat conditions, the size of an integrated hatchery program is limited to about 100,000 smolts if standards for a Primary population are to be met, and 200,000 smolts if standards for a Contributing population are to be met. As this population has no genetic legacy, managers may want to consider this a Contributing or even Stabilizing population. Habitat improvements will be required to achieve a naturally sustainable population. Information provided to us indicates that some natural production occurs. Fish are externally marked to evaluate strays.

Recommendations

Transition to local broodstock as soon as required facilities are operational. Until habitat can support an integrated population, maintain the current program until natural production appears evident. This segregated program using local broodstock would serve as a transitional phase in the reintroduction program. Returns in excess of broodstock needs should be allowed to spawn naturally.

Expansion of this program should be contingent on the development of a local broodstock.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

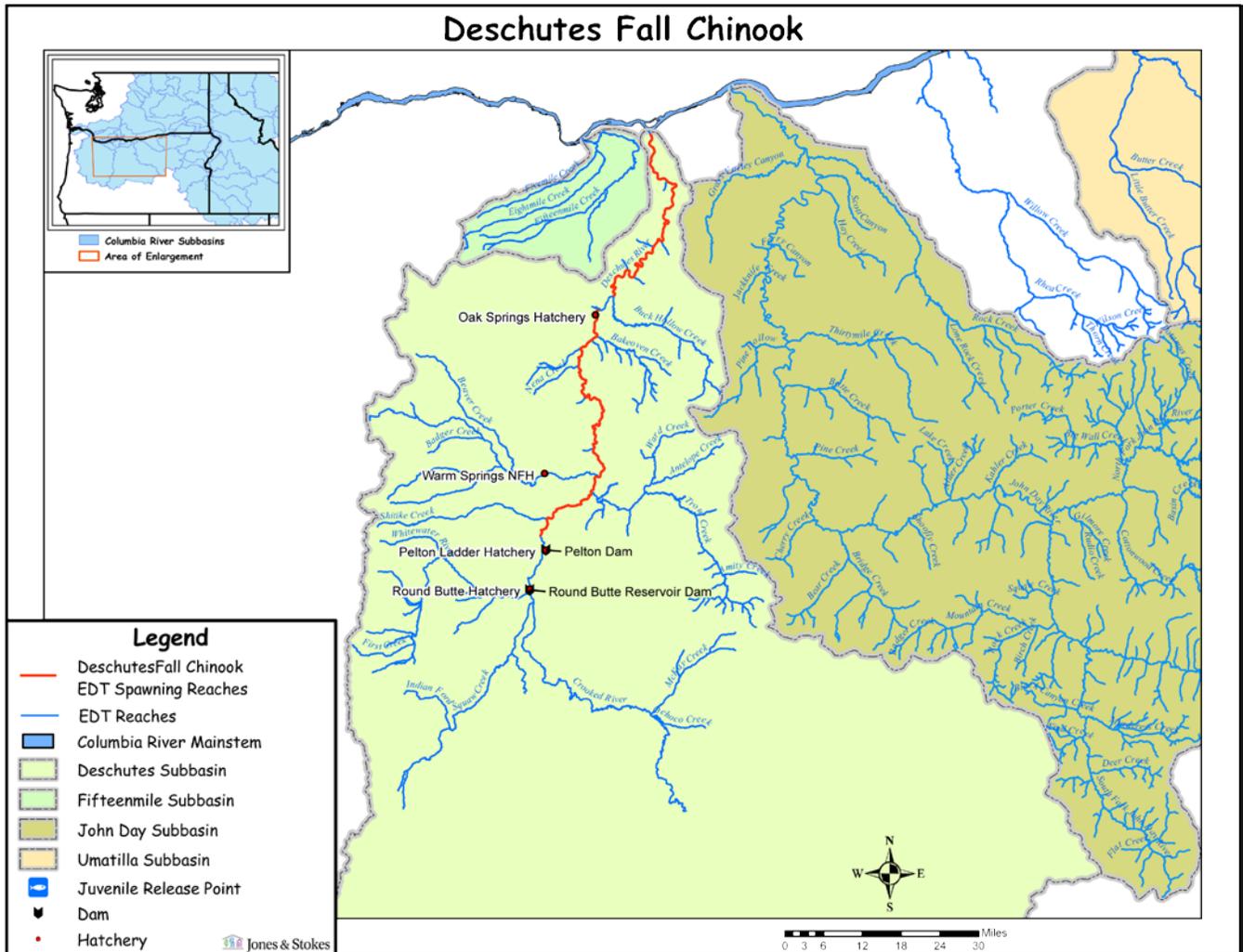
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Walla Walla Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 249.5 | 0% | 0% | 70% | 0.00 | 261 | 1.8 | 190 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 316 | 3.5 | 42 | - |
| HSRG Solution | Int Cons | 198.5 | 90% | 0% | 40% | 0.50 | 131 | 2.3 | 247 | 816 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 198.5 | 90% | 0% | 31% | 0.56 | 194 | 2.8 | 255 | 816 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Deschutes Summer-Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Deschutes Summer-Fall Chinook

The Deschutes River enters the Columbia at RM 205 above Bonneville and The Dalles dams. It drains 10,500 square miles (the second largest subbasin in the state). Originating in the Cascade Mountains, the Deschutes flows north along the eastern margin of the hills where the Cascades meet the low-lying flats to the east.

"Ocean type" Chinook (fall/summer run) typically enter the Pelton Trap during June and July. Prior to construction of the Pelton-Round Butte Hydroelectric Project, "ocean type" Chinook were thought to spawn in areas currently inundated by the project reservoirs and in the river areas immediately upstream (ODFW 2003).

A summer Chinook run is thought to have once returned to the Deschutes; however, this run is believed to have been lost after construction of the Pelton-Round Butte Project. Today, research suggests that only two indigenous races of Chinook salmon — spring Chinook and summer/fall Chinook — spawn and rear in the Deschutes subbasin. During the past 30 years, fish managers have not found any temporal or spatial separation during spawning in the lower Deschutes River that could verify distinct populations of summer and fall Chinook salmon within the subbasin. Both segments of the run appear to spawn in the same areas during the same time period and interbreeding between the two has been suspected for many years, suggesting that only one run exists (Deschutes Subbasin Plan 2004).

Fall Chinook spawn and rear in the lower 100 miles of the mainstem Deschutes River. ODFW and the Warm Springs Tribes have recorded fall Chinook salmon redds from RM 1 upstream of Moody Rapids to the area of the Pelton Fish Trap at RM 99.8. Following completion of the Pelton-Round Butte Project, most spawning occurred in the 6 miles of the lower Deschutes River from Dry Creek to the Pelton Reregulating Dam (Jonasson and Lindsay 1988; Huntington 1985). However, most fall Chinook have spawned downstream from Sherars Falls since the 1980s. Fall Chinook spawning has not been documented in any Deschutes River tributaries (Deschutes Subbasin Plan 2004).

The size of the fall Chinook run varies considerably from year to year, but is now substantially larger than in the past. This rise is primarily due to increased fall Chinook escapement to spawning areas in the lower Deschutes below Sherars Falls. Fish escapement above Sherars Falls has stayed relatively constant. Annual estimated escapement of fall Chinook spawners averaged 7,146 fish from 1977 to 2003, and ranged from a low of 2,205 fish in 1984 to a high of 20,678 in 1997. Annual escapement of adult fall Chinook upstream from Sherars Falls averaged 2,438 fish from 1977 through 2003, and 2,597 fish from 1993 through 2003. Annual spawning escapement of adult fall Chinook from the mouth of the Deschutes River up to Sherars Falls averaged 3,708 fish for the period 1977 through 2003, and 7,237 fish for the period 1993 through 2003 (French and Pribyl 2004) (Deschutes Subbasin Plan 2004).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Naturally spawning summer-fall Chinook in the Deschutes system are included in the Deschutes River Summer-Fall Run Chinook ESU, which was determined to not require listing under the ESA in 1998.
- Population Designation: Using a rating system similar to that used by the recovery planners for the lower Columbia and Willamette results in a designation of Primary for Deschutes summer-fall Chinook.
- Current Viability Rating: Unknown.
- Recovery Goal for Abundance: Unknown.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (from EDT): Productivity: 5.75; Capacity: 29,411.

2.2 Current Hatchery Programs Affecting this Population

No fall Chinook hatchery program currently operates in the Deschutes River; however, about 171 adult fall Chinook from other programs are estimated to stray into this system annually. Under the current scenario, pHOS is estimated at 1%. Annually, approximately 9,200 natural-origin adults are estimated to return the Deschutes River.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from out-of-basin hatchery programs: 171 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 2.5 to 2.7. Average abundance of natural-origin spawners (NOS) would increase from approximately 9,210 fish to approximately 9,841 fish. Harvest contribution of the natural and hatchery populations would go from approximately 10,735 fish to approximately 11,472 fish.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Deschutes River fall Chinook population was reviewed as a primary population. There are no hatchery programs for fall Chinook that operate in the Deschutes River. It is estimated that out-of-basin strays do not contribute to the natural spawning population.

Recommendations

The HSRG recommends that this population continue to be managed for natural production as a primary population.

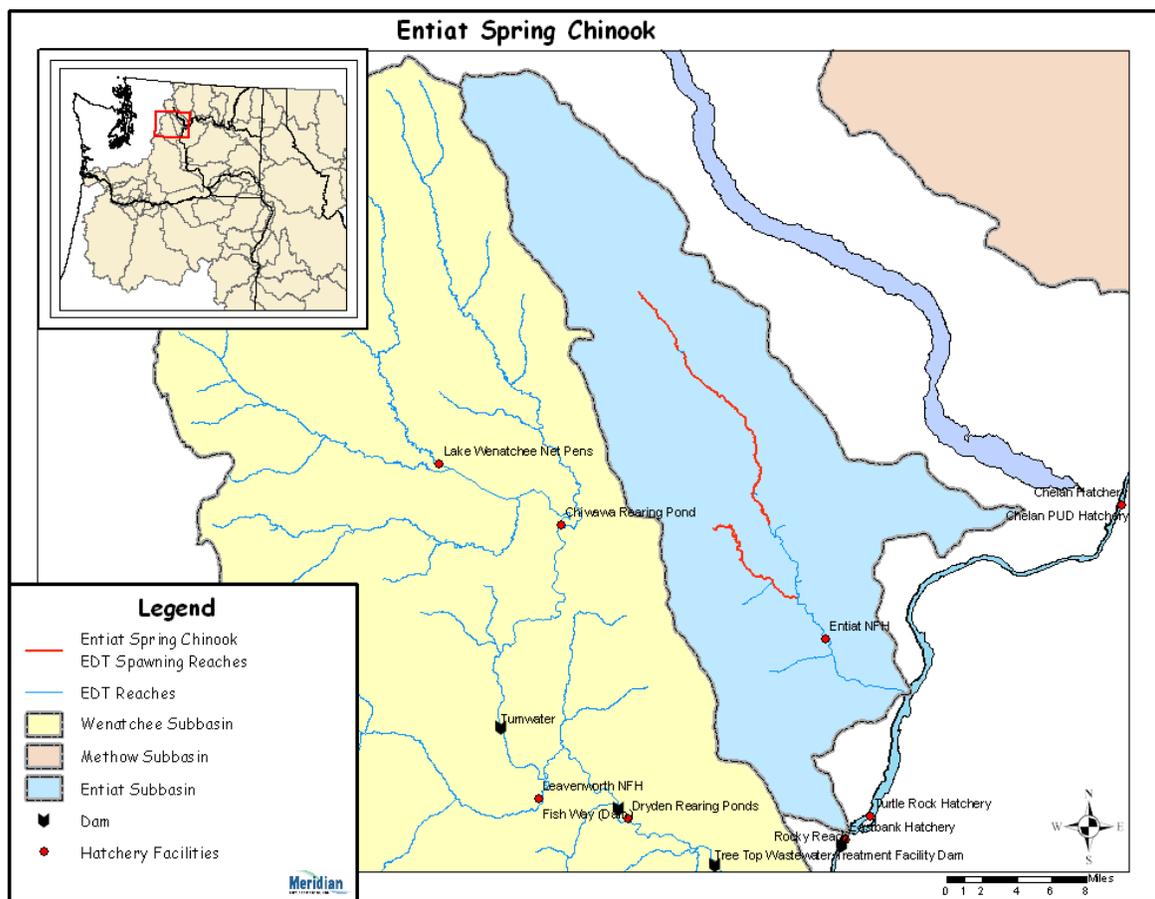
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Deschutes Summer Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 9,210 | 2.5 | 10,735 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 9,841 | 2.7 | 11,472 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 9,492 | 2.6 | 11,063 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 10,757 | 2.8 | 12,539 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Entiat River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Entiat River Spring Chinook

The Entiat River Spring Chinook natural population is part of the Upper Columbia River Spring Chinook salmon ESU that contains three extant populations- Wenatchee, Entiat and Methow river spring Chinook- and one extinct population, the Okanogan River spring Chinook (ICTRT 2004). Upper Columbia River Spring Chinook are classified as endangered under the Endangered Species Act (ESA). Spawning areas for Entiat Spring Chinook are shown on the map.

The Interior Columbia Technical Recovery Team (ICTRT) has classified the Entiat River spring Chinook as a “Basic” population in size based on its historic habitat potential. A “Basic” population is one that requires a minimum abundance of 500 wild spawners and a spawner to spawner (S/S) growth rate of greater than 2.8 to be viable.

According to the Upper Columbia Spring Chinook and Steelhead Recovery Plan (UCSSRP), spring Chinook have similar life-history characteristics as the spring/summer Chinook salmon runs originating in the Snake River system. In general, spring Chinook enter the tributaries of the Upper Columbia River from April through July, with peak passage occurring in May. Spawning occurs in the late summer to early fall. Juveniles spend one year in freshwater before migrating to the ocean (UCSRB 2007).

Historical spring Chinook run size to the Entiat River was estimated by Mullen et al. (1992) at about 3,400 fish (UCSRB 2007). Historically, Entiat River spring Chinook were present in the mainstem Entiat River and possibly the lower five miles of the Mad River.

2 Current Conditions

Entiat Spring Chinook spawn in the mainstem Entiat River and in the lower Mad River. Population diversity has likely been reduced due to habitat degradation, harvest, and the release of out-of-basin stock (Carson) from the Entiat National Fish Hatchery.

The abundance of 3+ spring Chinook in this subbasin has ranged from 18 to 1,197 fish for the period 1960 to 2003. The 12-year geometric mean of spawners in the Entiat River was estimated to be 92 fish at the time of ESA listing (range 90 to 490 spawners). The 12-year geometric mean for returns per spawner over this same time period was estimated to be 0.76 (range 0.41 to 1.12 returns per spawner).

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Entiat Spring Chinook.

- **ESA Status:** Entiat River Spring Chinook are part of the Upper Columbia River Salmon ESU, which was listed as Endangered under the ESA on June 28, 2005 (70 CFR 37160).
- **Population Description:** This population is classified by the ICTRT as a “basic” population. For the HSRG review, the population has been classified as Contributing.
- **Recovery Goal for Abundance:** 500 wild spawners

- **Productivity Improvement Expectation:** The 8-year geometric mean for abundance and productivity (i.e. growth rate) of naturally-produced spring Chinook in the Entiat will be improved to exceed the 10% extinction-risk (viability) curves developed by the ICTRT (e.g., ~ 500 spawners at a productivity (S/S) of 1.4) (UCSRB 2007)¹.
- **Habitat Productivity and Capacity:** Productivity: 1.97; Capacity: 344

2.2 Current Hatchery Programs Affecting this Population

Historically there has been a single hatchery program operating within the subbasin that may have affected the Entiat Spring Chinook population:

Entiat National Fish Hatchery Spring Chinook: This was a segregated harvest program as defined by the HSRG. The program had a goal to release up to 400,000 yearling spring Chinook each year to the Entiat River; however, releases were generally below this level due to decreasing spring Chinook abundance in the Upper Columbia River. Broodstock was of Carson origin. Genetic data collected on hatchery and wild spring Chinook in the subbasin indicate that hatchery fish have introgressed into or replaced the natural Entiat River population.

Based on the recommendations of the USFWS's internal hatchery reform review, the spring Chinook program has been eliminated and the focus of the facility will be to support the reintroduction of coho salmon in the Wenatchee and Methow rivers.

Estimated number of hatchery strays from integrated or segregated affecting this population:

- Hatchery strays from in-basin integrated programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 26 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The

¹ As productivity increases, abundance targets decrease. Thus, there are multiple combinations of productivity and abundance values that would achieve objectives. Additionally, the target level of improvement is less than required for delisting under ESA.

solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.9 to 1.9. Average abundance of natural-origin spawners (NOS) would increase from approximately 51 fish to approximately 164 fish. Harvest contribution of the natural and hatchery populations would go from approximately 7 fish to approximately 23 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects and harvest rates).

Observations

Managers have identified Entiat spring Chinook as an important population. For the purposes of this analysis, the HSRG assumed this population should be considered a Primary population. As currently managed, it is not consistent with that designation, having a pHOS greater than 0.10.

No hatchery programs for spring Chinook operate in the subbasin. The number of hatchery strays is small, but due to the small population, they contribute a relatively large proportion of fish on the spawning grounds.

Recommendations

The HSRG recommends that managers continue to monitor straying from out-of-basin hatchery programs. If out-of-basin hatchery strays are greater than 5%, take action to control it to less than this standard.

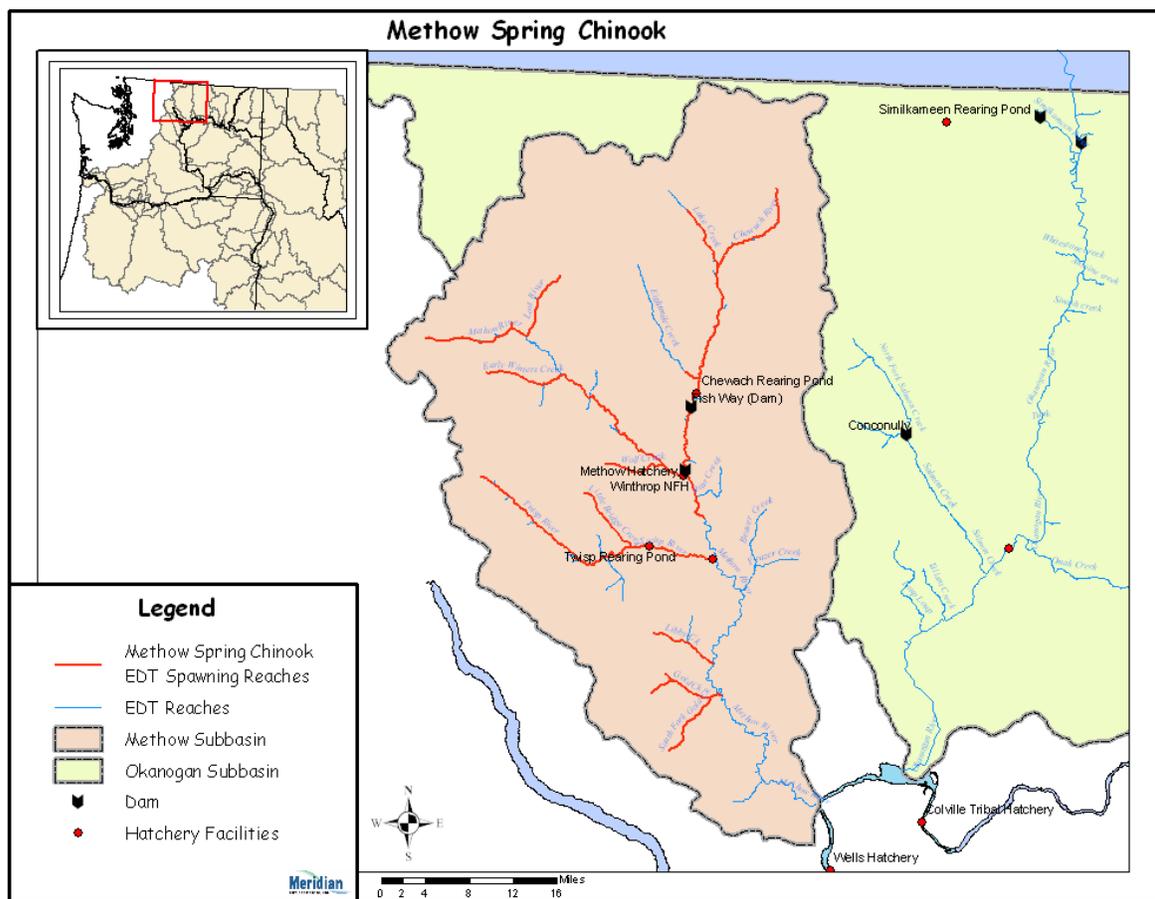
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Entiat Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 30% | 0.00 | 51 | 0.9 | 7 | 0 |
| | | | | | | | | | - | - |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 164 | 1.9 | 23 | - |
| HSRG Solution | None None | - | 0% | 75% | 3% | 0.00 | 108 | 1.5 | 15 | 0 |
| | | | | | | | | | - | - |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 75% | 2% | 0.00 | 165 | 1.8 | 23 | 0 |
| | | | | | | | | | - | - |

Hatchery Scientific Review Group Review and Recommendations

Methow River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Methow River Spring Chinook

The Methow River Spring Chinook natural population is part of the Upper Columbia ESU that currently contains three populations- Wenatchee, Entiat and Methow river spring Chinook- and one extinct population, the Okanogan River spring Chinook (ICTRT 2004). Upper Columbia River Spring Chinook are classified as endangered under the Endangered Species Act (ESA). Spawning areas are shown on the figure above.

The Interior Columbia Technical Recovery Team (ICTRT) has classified the Methow River spring Chinook as a “Very Large” population in size based on its historic habitat potential. A “Very Large” population is one that requires a minimum abundance of 2,000 wild spawners and an intrinsic productivity of greater than 1.75 spawner to spawner (S/S) to be viable.

According to the Upper Columbia Spring Chinook and Steelhead Recovery Plan (UCSSRP), spring Chinook have similar life-history characteristics as the spring/summer Chinook salmon runs originating in the Snake River system. In general, spring Chinook enter the tributaries of the upper Columbia River from April through July, with peak passage in May. Spawning occurs in the late summer to early fall. Juveniles spend one year in freshwater before migrating to the ocean (UCSRB 2007).

Historical Chinook run size to the Methow River was estimated by Mullen et al. (1992) at about 24,000 fish (UCSRB 2007)¹. Historically, Methow River spring Chinook were present in the mainstem Methow River and larger tributaries including the lower portion of the Twisp River, and mainstem Chewuch River up to Rkm 52 (UCSRB 2007). Methow spring Chinook may also have been present in Gold, Wolf and Early Winters creeks and the Lost River.

2 Current Conditions

Methow spring Chinook spawn in the mainstem Methow River and the Twisp, Chewuch and Lost River drainages. A few spawners can be found in Gold, Wolf and Early Winters creeks. Population diversity has likely been reduced due to habitat degradation, harvest, and the release of out-of-basin stock (Carson) from the Winthrop National Fish Hatchery. These releases were eliminated in 2000 as the hatchery program transitioned to the listed stock.

The abundance of 3+ spring Chinook in this subbasin has ranged from 33 to 9,904 fish for the period 1960 to 2003. The 12-year geometric mean of spawners in the Methow River was estimated to be 480 fish at the time of ESA listing (range 480 to 2,231 spawners). The 12-year geometric mean for returns per spawner over this same time period was estimated to be 0.51 (range 0.31 to 1.19 returns per spawner).

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Methow River Spring Chinook are part of the Upper Columbia River Spring Chinook Salmon ESU, which was listed as Endangered under the ESA on June 28, 2005 (70 CFR 37160).

¹ It is unclear whether summer Chinook occupied the Methow River; therefore, it is assumed that the majority of the 24,000 fish were spring Chinook.

- Population Description: The Methow River population is classified by the ICTRT as “Very Large”. For the HSRG review, the population has been classified as Primary.
- Recovery Goal for Abundance: 2,000 wild spawners
- Productivity Improvement Expectation: The 8-year geometric mean for abundance and productivity (i.e. growth rate) of naturally-produced spring Chinook within the Methow River population will be improved to exceed the 10% extinction-risk (viability) curves developed by the ICTRT (e.g., ~ 2,000 spawners at a productivity of 1.2) (UCSRB 2007) ².
- Habitat Productivity and Capacity:
Methow-Chewuch population component: Productivity: 1.92; Capacity: 900
Methow-Twisp population component: Productivity: 1.92; Capacity: 240

2.2 Current Hatchery Programs Affecting this Population

Hatchery programs operate within the subbasin that may affect the Methow Spring Chinook population:

1. Methow Spring Chinook (Methow Hatchery): This integrated conservation program has release goals of 550,000 yearling (15 fpp) spring Chinook to the Methow subbasin in April each year (Methow composite and Twisp stocks combined). Juveniles are released into the Methow River (184,000 Methow composite stock smolts) (Rkm 72.5), Twisp River acclimation pond (184,000 Twisp River stock only) (Rkm 8.6), Chewuch River acclimation pond (Rkm 83.2) and in Lake Creek (Chewuch River, Rkm 104) (184,000 Methow composite smolts). Fish not leaving acclimation ponds volitionally are forced out in May. Juveniles are 100% mass-marked. Smolt production goals have not been met for the Twisp stock (currently a combination of captive brood and anadromous brood).

Broodstock is collected at multiple trapping facilities in the subbasin: Methow Hatchery, Twisp River³, and adults are also collected at Wells Dam. Managers use genetic stock identification techniques to identify Twisp from Methow composite stock. Data indicate that 93% of the spring Chinook trapped for the Methow program is of hatchery-origin. All incubation and rearing activities take place at the hatchery. Juvenile fish are acclimated at the Twisp, Methow, and Chewuch acclimation sites.
2. Winthrop National Fish Hatchery Spring Chinook: A total of 600,000 yearling smolts (15 fpp) may be released in the Methow River from this segregated program each year (currently uses Methow composite stock, HOR by HOR crosses, but used Carson stock prior to 2003). Yearling smolts are forced out of the Foster-Lucas ponds in April. The rearing units are not set up for the volitional release of juveniles and would require extensive modification to do so. Juvenile fish are exposed to river water in the October prior to their release in the spring. Broodstock for this program was switched from Carson stock to Methow River-origin fish in 1999. Adults needed for broodstock volunteer (mostly HOR) or are transported from the Methow Hatchery (a rare event) and other locations. A future option is to use tributary traps to collect needed NOR broodstock. All incubation and juvenile rearing activities occur on-site.

² As productivity increases, abundance targets decrease. Thus, there are multiple combinations of productivity and abundance values that would achieve objectives. Additionally, the target improvement level is less than required for delisting under ESA.

³ The Twisp River site was collecting fish for the captive brood program that was phased out some time ago.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 859 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 921 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.9 to 1.9 with removal of either the Methow or Twisp Hatcheries. Average abundance of natural-origin spawners (NOS) would increase from approximately 433 fish to approximately 461 fish with the removal of the Methow hatchery, and from approximately 82 fish to approximately 123 fish with the removal of the Twisp hatchery. Harvest contribution of the natural and hatchery populations would go from approximately 255 fish to approximately 72 fish with the removal of the Methow hatchery and from approximately 57 fish to approximately 19 fish with the Twisp hatchery removed.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where

applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e. habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Managers have stated their goals for this program as; "Supporting the recovery of ESA listed species by increasing the abundance of natural adult populations, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity." (Goal statement adopted by Habitat Conservation Plan Committee, Hatchery Sub-Committee) To achieve this end the managers have identified a current mitigation goal of approximately 550,000 smolts for release within the basin (see smolt production by stock below). In addition, the Winthrop National Fish Hatchery (NFH) produces up to 600,000 smolts as part of its mitigation responsibility. Managers have identified Methow spring Chinook as an important population with some substructure components. For the purposes of this analysis, the HSRG assumed this population should be considered a Primary population. As currently managed, it is not consistent with that designation, having a PNI less than 0.5.

Current habitat productivity and capacity are significantly less than the recovery objective for the population. The hatchery programs are providing a conservation demographic benefit to the population by reducing extinction risks, but they also pose increased ecological and genetic risks to the natural population because of their current size. Achieving long-term recovery objectives would require improvements to habitat in the tributaries or mainstem.

There currently are two programs in the subbasin. The Methow Hatchery operates as two separate integrated programs (Methow composite stock and the Twisp stock). The Winthrop National Fish Hatchery (NFH) is intended to be operated as an integrated program (since 2001) using Methow composite stock of in-basin hatchery fish.

There are three components of the Methow Hatchery programs: Twisp River (release goal of 184,000 yearling smolts), Chewuch River (release goal of 184,000 yearling smolts) and the upper mainstem Methow River (release goal of 184,000 smolts). The Winthrop NFH program has an on-station release goal of 600,000 smolts. Currently, the Winthrop NFH release goal is achieved in most years. Smolt releases into the Twisp River have averaged approximately 50,000 smolts. We note that the smolt-to-adult survival rate in the Twisp is lower than in the Chewuch.

There are insufficient natural-origin fish in the basin to properly integrate the current Winthrop and Methow combined production.

For the Twisp population component, the HSRG was unable to craft a strategy that would meet the standards for a Primary or a Contributing population and still provide a demographic benefit to the population component within the constraints of the existing habitat (increase of NORs). This is because of the low productivity and capacity. Patterns of population abundance suggest a significant demographic risk to this component.

For the composite Methow-Chewuch population component, the HSRG was unable to craft a strategy that would meet the standards for a Primary population and provide a demographic benefit within the constraints of the existing habitat. The HSRG was, however, able to develop a

solution that could provide a demographic benefit as well as be consistent with the standards for a Contributing population.

If adult trapping facilities were made available on the mainstem Methow, a number of other options would be available.

Recommendations

The HSRG looked at various hatchery scenarios that could improve productivity, but could not significantly increase natural-origin spawning under current habitat conditions. Changes to the current program described below could be implemented to provide additional harvest opportunities and maintain the abundance of natural-origin spawners. The HSRG-suggested solution resulted in approximately the same number of natural-origin spawners as the No Hatchery scenario.

Production from either Methow or Winthrop facilities is capable of meeting the conservation needs for spring Chinook in the Methow. Managers should consider using excess hatchery capacity to achieve other conservation and/or harvest goals. As an example, Winthrop Hatchery could be managed to provide additional harvest opportunities for marked spring Chinook (in the Methow and/or below Chief Joseph Dam); or as a production facility for coho reintroduction in the upper Columbia; or to provide spring Chinook for reintroduction into the Okanogan River. Finally, Winthrop could be used to achieve any combination of the above programs.

The recommendations described below for the Twisp and Methow composite populations are meant to provide a short-term conservation strategy. When population productivity and capacity has increased, the managers should transition these programs to meet the standards of a Primary population (PNI greater than 0.67).

Composite Chewuch-Methow and Twisp population components: The HSRG recommends that managers continue to operate the programs as currently planned in the near term. The HSRG acknowledges that managing for the recommended PNI values for a Primary population may not be possible or appropriate when abundance levels are low. Managers should consider demographic risks to the population and modify their protocols during these periods. Managers also should develop a variable sliding scale for abundance so that in low abundance years, more of the appropriate stock is allowed to reach the spawning grounds.

An example of such a sliding scale would look like this:

Each year, depending on NOR run size, pNOB and pHOS are allowed to “float” or slide. The HSRG assumes managers will establish an acceptable level of removal of NORs for use in the hatchery brood. This will be a fixed percentage of the total NOR return (say 40%) and will not change, regardless of NOR return. In years of high NOR abundance, this 40% could make up 100% of the needed hatchery brood (pNOB= 100%). In that case, no HORs would be used in the hatchery brood. Hatchery fish can be allowed to reach the spawning ground (pHOS) if needed to achieve an appropriate number of fish spawning naturally (demographic benefit and use of available habitat). This however, would not be required during years of very high NOR returns as both objectives (pNOB and natural spawning) may be met with NORs.

In years of low NOR abundance, the same 40% of the NOR return would be removed for use in the hatchery brood (pNOB). However, in these years, that 40% may make up only a small part of the needed brood (i.e. pNOB 10%). In these years, enough HORs should be used to achieve needed hatchery brood and additional HORs should be allowed to spawn naturally (pHOS) to achieve the minimum acceptable level of naturally spawning.

The goal of this sliding scale is to achieve an “average” PNI over time of the desired level (0.67 or 0.5) depending on the population designation even though it may not be achieved in any one

year. A good way to determine the level of NORs that should be removed each year (see above) is to review the return of NORs over a long time frame and iterate what level (30, 40, 50%) are needed, on average, to achieve the desired PNI.

Winthrop National Fish Hatchery: If managers decide to keep the existing on-station program at Winthrop for harvest objectives, it will require; (1) adipose fin-clipping the entire production; (2) removal of 80% of the unharvested returning adults. The HSRG encourages managers to develop a terminal selective fishery to assist in this removal and develop additional uses for the excess hatchery fish removed (food bank donations , stream nitrification).

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

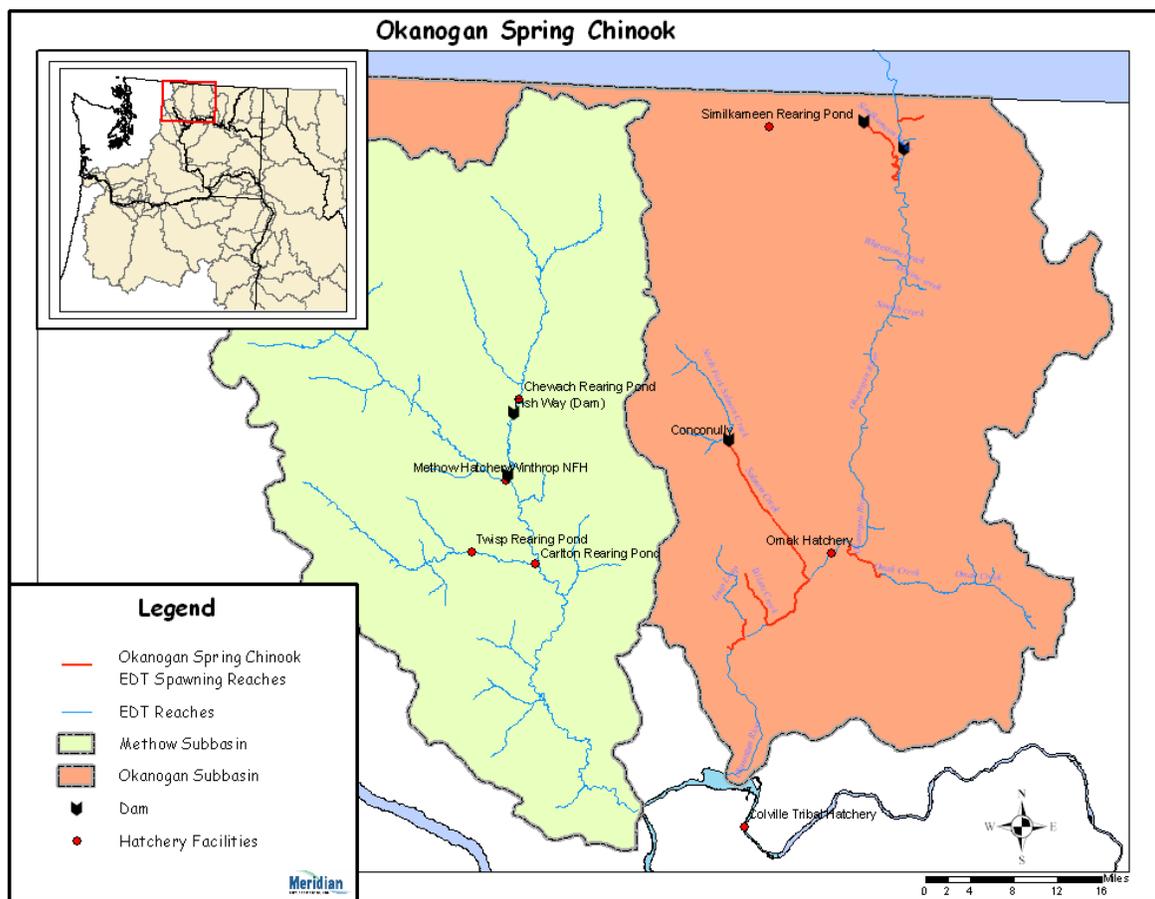
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Methow Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|---------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Methow - Chewuch Int Cons | 359.1 | 40% | 0% | 72% | 0.06 | 433 | 0.9 | 255 | 284 |
| | Twisp Int Cons | 183.0 | 40% | 0% | 78% | 0.29 | 82 | 0.9 | 57 | 33 |
| | Winthrop Seg Harv | 601.5 | 40% | | | | | | 233 | 260 |
| No Hatchery | Methow - Chewuch None | - | 0% | 0% | 0% | 1.00 | 461 | 1.9 | 72 | - |
| | Twisp None | - | 0% | 0% | 0% | 1.00 | 123 | 1.9 | 19 | - |
| HSRG Solution | Methow - Chewuch Int Cons | 359.1 | 40% | 0% | 61% | 0.08 | 406 | 0.9 | 604 | 205 |
| | Twisp Int Cons | 183.0 | 40% | 0% | 69% | 0.31 | 72 | 1.0 | 131 | 21 |
| | Winthrop Seg Harv | 601.5 | 80% | | | | | | 671 | 657 |
| HSRG Solution w/ Improved Habitat | Methow - Chewuch Int Cons | 359.1 | 40% | 0% | 58% | 0.08 | 456 | 1.0 | 612 | 205 |
| | Twisp Int Cons | 183.0 | 40% | 0% | 65% | 0.32 | 86 | 1.1 | 133 | 21 |
| | Winthrop Seg Harv | 601.5 | 80% | | | | | | 671 | 657 |

Hatchery Scientific Review Group Review and Recommendations

Okanogan River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Okanogan River Spring Chinook

Okanogan Spring Chinook are considered part of the Upper Columbia River ESU that contains three extant populations- Wenatchee, Entiat and Methow river spring Chinook, and one extinct population - Okanogan River spring Chinook (ICTRT 2004). Upper Columbia River spring Chinook are classified as endangered under the Endangered Species Act.

Data provided in the upper Columbia River recovery plan indicate that spring Chinook likely spawned in Salmon Creek, Omak Creek and in portions of the subbasin in Canada (UCSRB 2007). There is no evidence that spring Chinook used the Similkameen River upstream of the falls (near Enloe Dam). There are no estimates of historical spring Chinook abundance for the Okanogan River.

2 Current Conditions

Currently, there are no naturally-produced spring Chinook in the Okanogan River subbasin. The Colville Tribes, through the Chief Joseph Master Plan, propose to reintroduce spring Chinook to the Okanogan River (see Chief Joseph Hatchery discussion below).

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Upper Columbia River Spring Chinook are listed as endangered. The Okanogan population is considered extinct.
- Population Description: Extinct
- Recovery Goal for Abundance: Not Applicable
- Productivity Improvement Expectation: Increase over time as habitat actions designed to improve the abundance and productivity of ESA listed steelhead are implemented in the subbasin.
- Habitat Productivity and Capacity: Productivity: 0.9; Capacity: 259

2.2 Current Hatchery Programs Affecting this Population

Currently there are no hatchery programs for spring Chinook in the Okanogan River. The Chief Joseph Hatchery Master Plan calls for the development of two spring Chinook programs (an integrated conservation program and a segregated harvest program) in the Okanogan subbasin that would be operated simultaneously. To achieve this objective, the Colville Tribe proposes to construct Chief Joseph Hatchery at Chief Joseph Dam on the Columbia River. The program would produce 900,000 spring Chinook for both harvest and conservation purposes. Initially, this program proposes to use Carson stock for broodstock.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 0

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.8 to 0.9. Average abundance of natural-origin spawners (NOS) would be unchanged. The harvest contribution of the natural and hatchery populations would be zero.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Okanogan spring Chinook have been extirpated; however, there are plans to reintroduce the species into the subbasin. There is no current spring Chinook program in the Okanogan River. Since 2001, there have been intermittent releases into the Okanogan subbasin when there are surplus juveniles from Winthrop National Fish Hatchery (NFH) or Entiat NFH. From these releases managers have documented that spring Chinook can return to spawn in Omak Creek and successfully produce juveniles. SARs for these hatchery releases have been very low.

The Colville Tribes are initiating a significant habitat improvement program. Without habitat improvements, it is unlikely that a spring Chinook population in the Okanogan River tributaries or Canadian Okanogan River would be self-sustaining.

The Colville Tribes have management goals to reintroduce spring Chinook into historical Canadian and U.S. habitats to provide conservation benefits and terminal harvest opportunities. The Tribes also seek to release spring Chinook in the mainstem Columbia River (below Chief Joseph Dam) for tribal and recreational fisheries.

Recommendations

To reintroduce spring Chinook into the Okanogan River, the HSRG recommends that the Okanogan population be managed using a phased transition approach, as described below. Hatchery facilities should be developed to provide within-basin full-term rearing to meet both conservation and fishery objectives. If this is not possible, long-term acclimation and adult recapture facilities should be developed within the subbasin.

Phase 1: The managers should identify appropriate stable sources of broodstock to support the reintroduction and harvest objectives. Managers should transition to local broodstock as soon as required facilities are operational and Chinook runs can support an independent local broodstock program.

Phase 2: As benefits from planned habitat improvements occur, introduce spring Chinook from the locally adapted hatchery population into these habitats.

Phase 3: As habitat capacity and productivity increases and as the number of naturally-produced spring Chinook also increases, natural-origin adults should be incorporated into the hatchery broodstock in ever-increasing proportions to achieve a PNI initially greater than 0.5. Once the natural population abundance increases, more of the hatchery production could be used to provide harvest.

Segregated Harvest Program: To meet sport and tribal harvest objectives, a segregated program could be considered below Chief Joseph Dam. In selecting a broodstock for this program, the managers should consider using either upper Columbia spring Chinook surplus to other conservation programs (see Methow recommendations) or the Leavenworth population of Carson-stock spring Chinook (see Wenatchee recommendations).

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when

broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

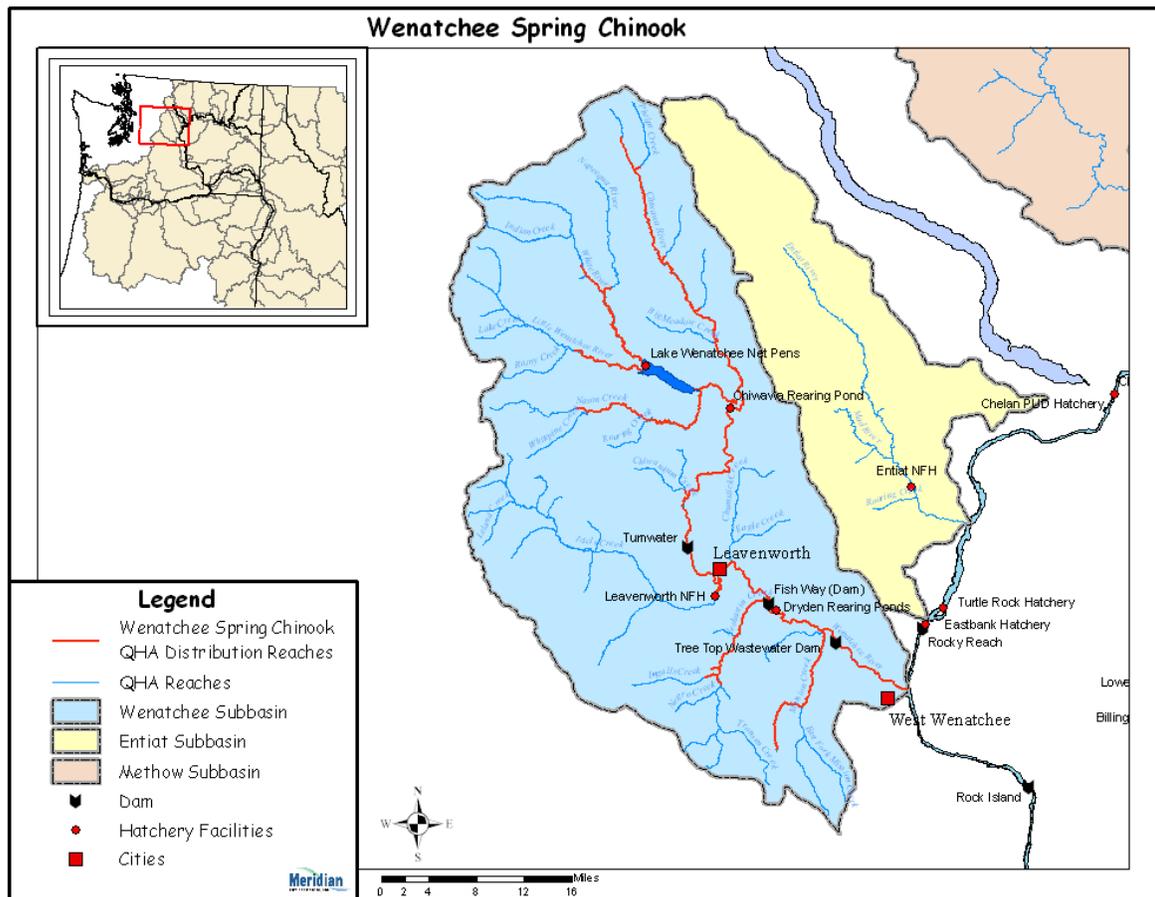
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Okanogan Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 0.00 | 0 | 0.8 | 0 | - |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 0.00 | 0 | 0.9 | 0 | - |
| | | | | | | | | | | |
| HSRG Solution | Int Cons | 53.9 | 50% | 0% | 62% | 0.14 | 33 | 0.4 | 39 | 42 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 53.9 | 50% | 0% | 59% | 0.14 | 38 | 0.5 | 40 | 42 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Wenatchee River Spring Chinook Population And Related Hatchery Programs

January 31, 2009



1 Wenatchee River Spring Chinook

The Wenatchee Spring Chinook natural population is part of the Upper Columbia ESU that contains three extant populations- Wenatchee, Entiat and Methow rivers, and one extinct population, the Okanogan River spring Chinook (ICTRT 2004). Upper Columbia River spring Chinook are classified as endangered under the Endangered Species Act (ESA). Major and minor spawning areas are shown on the figure above.

The Interior Columbia Technical Review Team (ICTRT) has classified the Wenatchee River spring Chinook as a “Very Large” population in size based on its historic habitat potential. A “Very Large” population is one that requires a minimum abundance of 2,000 wild spawners and an intrinsic productivity greater than 1.75 recruits per spawner (R/S) to be viable. According to the Upper Columbia Spring Chinook and Steelhead Recovery Plan (UCSSRP), spring Chinook have similar life-history characteristics to those runs originating in the Snake River system. In general, spring Chinook enter the tributaries of the upper Columbia River from April through July, with peak passage in May. Spawning occurs in the late summer to early fall. Juveniles spend one year in freshwater before migrating to the ocean (UCSRB 2007).

Historical Chinook run size to the Wenatchee River was about 41,000 fish; however, the proportion that was spring Chinook is not known (UCSRB 2007). Wenatchee River spring Chinook were likely distributed throughout the main river, portions of the Chiwawa, Little Wenatchee, White River, Nason Creek, Icicle Creek and Peshastin Creek. Based on intrinsic productivity analysis, spring Chinook may have also used portions of Mission and Chiwaukum creeks.

2 Current Conditions

Spring Chinook currently spawn in the upper mainstem Wenatchee River, upstream from the mouth of the Chiwawa River, in the Chiwawa River, Nason Creek, Little Wenatchee River and White River. During periods of higher adult abundance, spring Chinook may also spawn in Chiwaukum Creek. From 2001 through 2005, Leavenworth (Carson stock) adult spring Chinook were planted in Peshastin Creek. These planted fish were not part of the ESU. Fish spawning in Icicle Creek are from out-of-basin (non-listed spring Chinook) from the Leavenworth National Fish Hatchery.

From 1960 through 2003, the abundance of 3+ spring Chinook for this subbasin ranged from 51 to 6,718 fish. The 12-year running geometric mean of spawners in the Wenatchee River has ranged from 383 to 3,449, and were 417 spawners at the time of species listing. Returns-per-spawner over this same period ranged from 0.31 to 1.19, with a geometric mean of 0.74. Smolts produced per redd surveyed was estimated at 364, 250 for the Chiwawa area upstream of Tumwater Canyon and 197 in the Wenatchee subbasin.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Wenatchee River spring Chinook are part of the Upper Columbia River Salmon ESU, which was listed as Endangered under the ESA on June 28, 2005 (70 CFR 37160).
- **Population Description:** The Wenatchee population is classified by the ICTRT as “Very Large”. For the HSRG review, the population has been classified as Primary.

- Recovery Goal for Abundance: 2,000 wild spawners
- Productivity Improvement Expectation: The 8-year geometric mean for abundance and productivity (i.e. growth rate) of naturally-produced spring Chinook within the Wenatchee population will be improved to exceed the 10% extinction-risk (viability) curves developed by the ICTRT (e.g., ~ 2,000 spawners at a productivity of 1.75) (UCSRB 2007) ¹.
- Habitat Productivity and Capacity:
 - Chiwawa Population Component: Productivity: 5; Capacity: 598
 - Nason Creek Population Component: Productivity:2.8; Capacity:371
 - White River Population Component: Productivity: 4.8; Capacity: 253
 - Leavenworth NFH Population Component: N/A

2.2 Current Hatchery Programs Affecting this Population

There are three in-basin hatchery programs that may affect the Wenatchee Spring Chinook population:

1. Chiwawa River Spring Chinook (Eastbank Hatchery): This program can release up to 672,000 smolts yearly from the Eastbank Hatchery as part of an integrated conservation program although this number has not been achieved (average 350,000 smolts). Adults are collected from the Chiwawa River and at Tumwater Dam². Fish spawning and incubation activities take place at Eastbank Hatchery. Yearlings (12 fpp) are released in the spring into the Chiwawa River (acclimated at the Chiwawa Rearing Ponds). The HGMP notes that 27% of returning adults from the program stray to areas outside of the Chiwawa River. A DNA pedigree analysis is currently in progress to determine the success of the Chiwawa Hatchery population and naturally-produced spring Chinook. All smolts released are 100% adipose fin-clipped or are externally mark using other methods. The program has an R/S of 6.4.
2. Wenatchee River/White River Captive Brood (Eastbank Hatchery): This is a juvenile-based captive brood program that will produce approximately 150,000 yearling fish (second generation) for release to the White River. Currently, egg incubation and early rearing occurs at the Little White Salmon National Fish Hatchery. Adults of White River origin will be collected either at Tumwater Dam (using DNA pedigree analysis) or the White River. The current juvenile component of the program uses eggs collected from 50 redds in the White River. An adult-based supplementation program will be implemented in the future. Program has an R/S of 2.65.
3. Wenatchee Icicle Creek (Leavenworth Hatchery): This segregated harvest program releases 1.63 million smolts (15-18 fpp) each year from the Leavenworth National Fish Hatchery into Icicle Creek. Broodstock used in the program are volunteers returning to the hatchery. All egg incubation and juvenile rearing activities occur on station. Yearling smolts are force-released directly from the raceways starting in mid-April. The program also releases 500 adult spring Chinook into Peshastin and Ingalls creeks. All juveniles released from the facility are 100% adipose fin-clipped. R/S of 2.9 for this program.

Estimated number of hatchery strays affecting the Wenatchee spring Chinook population:

¹ As productivity increases, abundance targets decrease. Thus, there are multiple combinations of productivity and abundance values that would achieve program objectives.

² A genetic marker is needed for Chiwawa River-origin fish before they can be collected at Tumwater Dam.

- Hatchery strays from in-basin integrated programs: 1,110 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 110 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) for Nason Creek would increase from 1.2 to 2.7. Average abundance of natural-origin spawners (NOS) would increase from approximately 107 fish to approximately 245 fish. Harvest contribution of the natural and hatchery populations would go from approximately 16 fish to approximately 37 fish. The analysis of the Chiwawa estimated that Adjusted Productivity would increase from 2.3 to 4.8. Average abundance of NOS would increase from approximately 277 fish to approximately 502 fish. Harvest contribution of the natural and hatchery populations would go from approximately 389 fish to approximately 76 fish. For the White River population component, estimated Adjusted Productivity would increase from 2.1 to 4.6. Average abundance of NOS would increase from approximately 130 fish to approximately 211 fish. Harvest contribution of the natural and hatchery populations would increase from approximately 46 fish to approximately 32 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Managers have stated their goals for this program as: "Supporting the recovery of ESA listed species by increasing the abundance of natural adult populations, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity" (Goal statement adopted by Habitat Conservation Plan Committee, Hatchery Sub-Committee). To achieve this end, the managers identified a current mitigation goal of 672,000 smolts for release within the basin (150,000 White; 250,000 Nason; 272,000 Chiwawa). Until recently, all smolts have been released into the Chiwawa and have been of Chiwawa origin. Managers have identified Wenatchee spring Chinook as an important population with five substructure components. For the purposes of this analysis, the HSRG assumed this population should be considered a Primary population. As currently managed, it is not consistent with that designation, having a PNI less than 0.5.

The **White River** population component is genetically distinct and occupies unique habitat within the basin. White River is a major tributary to Lake Wenatchee, is glacial fed, and the spring Chinook in this river may have unique physiological and life history characteristics. This small population component is currently part of a captive broodstock program derived from eyed eggs pumped from redds in the White River. This subbasin appears capable of supporting 200-250 spawning adult fish under current and expected improved habitat conditions and does not appear capable of supporting substantially larger spawner abundance. The captive broodstock program released less than 2,000 yearling smolts annually prior to the 2005 brood year, but released 60,000 and 142,000 yearling smolts from brood years 2005 and 2006, respectively. Fish are currently reared at the Little White Salmon National Fish Hatchery (NFH) in the Columbia Gorge region. We understand that managers plan to transition to a traditional program (based on the spawning of returning adults) with a target release of 150,000 yearling smolts per year.

The **Little Wenatchee** population component is very depressed and has limited habitat potential. This stream is a tributary to Lake Wenatchee and, therefore, this spring Chinook spawning aggregate may also have unique characteristics associated with migration through a lake. The genetic and demographic relationship to the White River population is unknown.

The planned release for the **Chiwawa population component** is 672,000 smolts per year; however, the average release has been approximately 350,000 smolts. The program smolt release objective is scheduled to be reduced to 298,000 smolts by 2013. The broodstock management protocol has been to collect no more than 33% of the natural-origin adults, leading to an average pNOB of 36% and an average pHOS exceeding 60%. The habitat capacity within the Chiwawa River does not appear to be able to support an integrated program of 672,000 smolts consistent

with the criteria for a Primary designation. All hatchery fish released from the Chiwawa River have both a clipped adipose fin and coded-wire tag.

Chiwawa-origin hatchery fish have been observed to stray to all of the Wenatchee population components upstream of Tumwater Canyon. We understand that operational changes have been adopted at the water intake structure that should reduce this straying.

The **Nason Creek** population component is depressed, but historically was an important component of the Wenatchee River population of spring Chinook. This stream habitat has potential to be improved. Currently there is no hatchery-directed program for the Nason Creek population component; however, plans are in development to initiate a program in the near future as part of Grant County PUD's mitigation obligation.

The **Leavenworth** NFH program is a self-sustaining segregated hatchery population of Carson NFH origin. The current Leavenworth NFH population is considered locally adapted, highly successful in the Wenatchee system, and provides significant harvest benefits in Icicle Creek. While the stray rate from this hatchery program is low, the impact on the small receiving natural components of the Wenatchee population in the upper watershed is a concern. Leavenworth NFH fish can be differentiated from the integrated programs in the upper basin (e.g., Chiwawa hatchery fish) by an adipose fin-clip and the lack of coded-wire tag, although some index groups released from Leavenworth NFH also carry a coded-wire tag for fishery assessments.

Recommendations

The HSRG acknowledges that managing for the recommended PNI values may not be possible or appropriate in the near term when abundance levels are low and demographic risks to the population increase. To address this concern, managers should develop a variable sliding scale for managing abundance so that in low abundance years, more hatchery-origin fish of the appropriate population component are allowed to reach the spawning grounds to reduce demographic risk to the respective populations. A variable abundance sliding scale for managing natural spawners should be incorporated into each of the program-specific recommendations described below. The near-term focus for each integrated program described below should prioritize contributing to the conservation goals in the upper basin.

An example of such a sliding scale would look like this:

Each year, depending on NOR run size, pNOB and pHOS are allowed to "float" or slide. The HSRG assumes managers will establish an acceptable level of removal of NORs for use in the hatchery brood. This will be a fixed percentage of the total NOR return (say 40%) and will not change, regardless of NOR return. In years of high NOR abundance, this 40% could make up 100% of the needed hatchery brood (pNOB= 100%). In that case, no HORs would be used in the hatchery brood. Hatchery fish can be allowed to reach the spawning ground (pHOS) if needed to achieve an appropriate number of fish spawning naturally (demographic benefit and use of available habitat). This however, would not be required during years of very high NOR returns as both objectives (pNOB and natural spawning) may be met with NORs.

In years of low NOR abundance, the same 40% of the NOR return would be removed for use in the hatchery brood (pNOB). However, in these years, that 40% may make up only a small part of the needed brood (i.e. pNOB 10%). In these years, enough HORs should be used to achieve needed hatchery brood and additional HORs should be allowed to spawn naturally (pHOS) to achieve the minimum acceptable level of naturally spawning.

The goal of this sliding scale is to achieve an “average” PNI over time of the desired level (0.67 or 0.5) depending on the population designation even though it may not be achieved in any one year. A good way to determine the level of NORs that should be removed each year (see above) is to review the return of NORs over a long time frame and iterate what level (30, 40, 50%) are needed, on average, to achieve the desired PNI.

The HSRG identified two potential options to manage the Wenatchee populations. One option includes transitioning the Leavenworth NFH to a locally-derived stock; the second option keeps the Leavenworth program unchanged.

Option 1: This option achieves the standards of a Primary designation for the composite Wenatchee population; however, not all individual components achieve this designation. This option maintains a reserve for individual components while maintaining the current Leavenworth program. Population-specific recommendations under this option are as follows:

White River: Once the transition from a captive broodstock to an anadromous broodstock has been accomplished, a program up to 150,000 smolts could be released consistent with managing the White River as a component of the Wenatchee Primary population. This would require a 33% pNOB and controlling the proportion of hatchery fish spawning to achieve a pHOS less than 33%. This could be accomplished by removing approximately 85% of hatchery-origin fish at Tumwater Dam which will contribute to hatchery broodstock and other uses including harvest, food bank donations and stream nitrification. In the rebuilding phase, a high pHOS may be appropriate to help increase abundance of natural-origin spawners.

Chiwawa: A program of up to 150,000 smolts could be released consistent with managing the Chiwawa as a component of the Wenatchee Primary population. This would require a 45% pNOB and controlling the proportion of hatchery fish spawning to achieve a pHOS less than 15%. This could be accomplished by removing approximately 85% of hatchery-origin fish at Tumwater Dam which will contribute to hatchery broodstock and other uses including harvest, food bank donations and stream nitrification.

Nason Creek: A program up to 150,000 smolts could be released consistent with managing Nason Creek as a component of the Wenatchee Primary population. This would require a 33% pNOB and controlling the proportion of hatchery fish spawning to achieve a pHOS less than 33%. This could be accomplished by removing approximately 85% of hatchery-origin fish at Tumwater Dam which will contribute to hatchery broodstock and other uses including harvest, food bank donations and stream nitrification.

Leavenworth National Fish Hatchery: The current hatchery program could be operated consistent with a Primary designation for the Wenatchee population if all identifiable Leavenworth Hatchery fish are removed at Tumwater Dam.

Additional Production Opportunities: In addition to the specific program recommendations described above, the HSRG suggests that additional production up to 800,000 smolts could be developed in the lower watershed to provide additional fishery opportunities. Surplus hatchery fish from the integrated programs described above could be used for this program. This opportunity is contingent upon removing strays at Tumwater Dam.

Option 2: This option achieves the standards of a Primary designation for each individual component of the Wenatchee population while providing broodstock to transition Leavenworth to a native based stock. This option maintains a reserve for individual components while providing broodstock for stepping stone harvest programs in the lower basin.

Population-specific recommendations under this option are as follows:

White River: Once the transition from a captive broodstock to an anadromous broodstock has been accomplished, a program up to 150,000 smolts could be released consistent with managing the White River as a component of the Wenatchee Primary population. This would require a 10% pNOB and controlling the proportion of hatchery fish spawning to achieve a pHOS less than 5%. This could be accomplished by removing approximately 98% of hatchery-origin fish at Tumwater Dam. In the near term, a high pHOS for up to three generations may be appropriate to help increase abundance of natural-origin spawners.

Chiwawa: A program of up to 430,000 smolts could be released consistent with managing the Chiwawa as a component of the Wenatchee Primary population. This would require a 10% pNOB and controlling the proportion of hatchery fish spawning to achieve a pHOS less than 5%. This could be accomplished by removing approximately 98% of hatchery-origin fish at Tumwater Dam.

Nason Creek: A program up to 160,000 smolts could be released consistent with managing Nason Creek as a component of the Wenatchee Primary population. This would require a 10% pNOB and controlling the proportion of hatchery fish spawning to achieve a pHOS less than 5%. This could be accomplished by removing approximately 98% of hatchery-origin fish at Tumwater Dam.

Leavenworth National Fish Hatchery: The current hatchery program could be operated consistent with a Primary designation for the Wenatchee population if all identifiable Leavenworth Hatchery fish are removed at Tumwater Dam. The HSRG understands that co-managers are considering transitioning the current broodstock to a Wenatchee-based stock. If managers decide to replace the current Leavenworth stock, they should consider maintaining this stock at another suitable location or by maintaining a smaller program at Leavenworth Hatchery.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

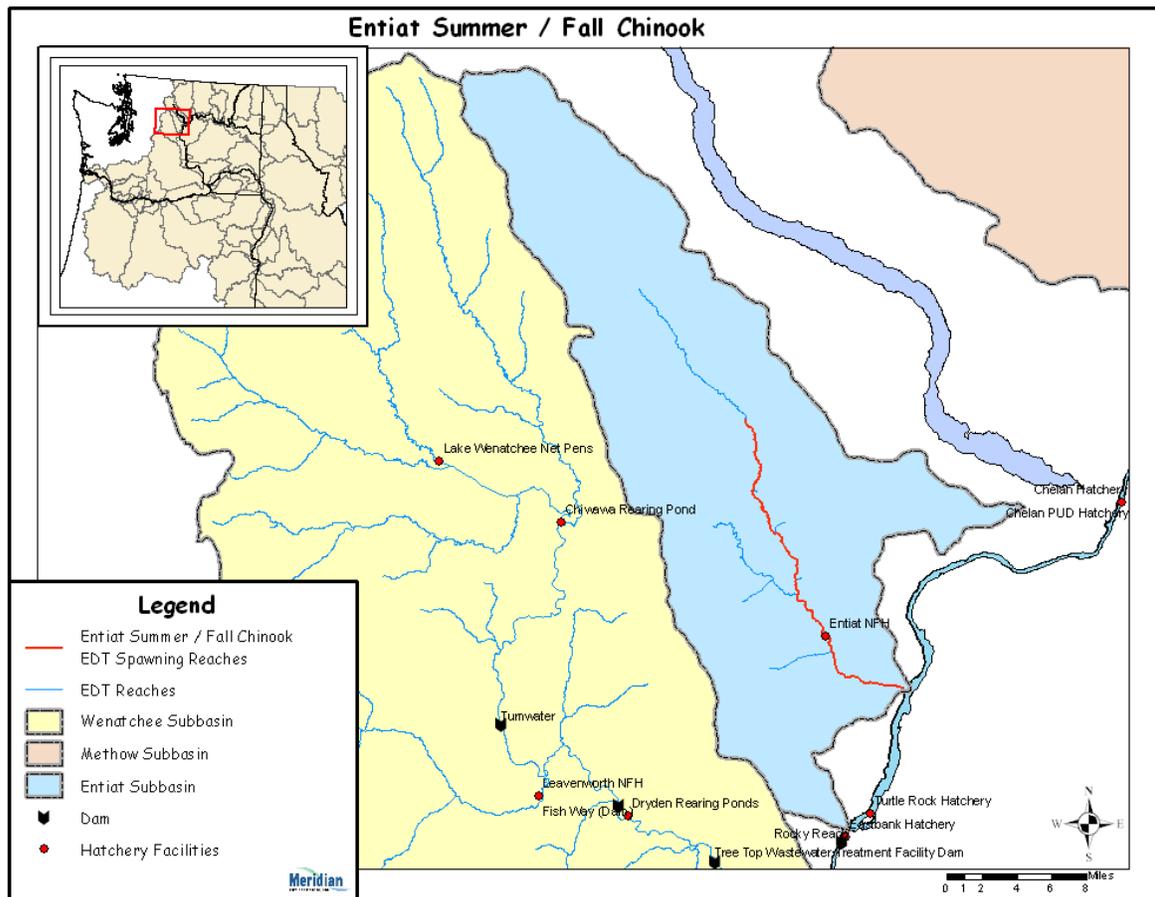
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Wenatchee Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|----------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Nasson Int Cons | - | 0% | 0% | 26% | 0.00 | 107 | 1.2 | 16 | 0 |
| | Chiwawa Int Cons | 351.5 | 30% | 0% | 75% | 0.32 | 277 | 2.3 | 389 | 275 |
| | White Int Cons | 65.9 | 0% | 0% | 43% | 0.00 | 130 | 2.1 | 46 | 1 |
| | Leavenworth Seg Harv | 1,650.2 | 98% | | | | | | 1,655 | 491 |
| No Hatchery | Nasson None | - | 0% | 0% | 0% | 1.00 | 245 | 2.7 | 37 | - |
| | Chiwawa None | - | 0% | 0% | 0% | 1.00 | 502 | 4.8 | 76 | - |
| | White None | - | 0% | 0% | 0% | 1.00 | 211 | 4.6 | 32 | - |
| HSRG Solution | Nasson Int Cons | 149.1 | 35% | 85% | 29% | 0.54 | 131 | 1.9 | 179 | 526 |
| | Chiwawa Int Cons | 149.1 | 35% | 85% | 12% | 0.79 | 425 | 4.4 | 225 | 538 |
| | White Int Cons | 149.1 | 35% | 85% | 32% | 0.51 | 126 | 3.2 | 200 | 608 |
| | Leavenworth Seg Harv | 2,475.3 | 98% | | | | | | 2,699 | 904 |
| HSRG Solution w/ Improved Habitat | Nasson Int Cons | 149.1 | 35% | 85% | 22% | 0.60 | 184 | 2.2 | 187 | 526 |
| | Chiwawa Int Cons | 149.1 | 35% | 85% | 11% | 0.81 | 491 | 4.9 | 235 | 538 |
| | White Int Cons | 149.1 | 35% | 85% | 27% | 0.55 | 156 | 3.7 | 204 | 608 |
| | Leavenworth Seg Harv | 2,475.3 | 98% | | | | | | 2,699 | 904 |

Hatchery Scientific Review Group Review and Recommendations

Entiat Summer Chinook Population and Related Hatchery Programs

January 31, 2009



1 Entiat River Summer Chinook

The Entiat summer/fall-run Chinook is likely the descendents of hatchery fish released by the Entiat National Fish Hatchery from 1941 to 1976. According to the Entiat Subbasin Plan, summer/fall-run Chinook were not native to the Entiat River (NPPC 2004). Entiat summer Chinook are considered part of the Upper Columbia River summer/fall-run Chinook ESU that includes all late-run (summer and fall), ocean-type Chinook salmon in the mainstem Columbia River and its tributaries between Chief Joseph and McNary dams (excluding Marion Drain). NMFS concluded that at the time of their review, this larger ESU did not merit protection under ESA (NMFS 1995 and 50 CFR Parts 222, 226, and 227).

2 Current Conditions

Entiat River summer/fall Chinook begin entering the subbasin in June. These fish spawn in late September to early November in the lower 23 miles of the mainstem Entiat River downstream of Preston Creek. Summer/fall-run redd counts made since 1957 show that adult abundance is less than 250 fish.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Not Listed
- Population Description: Entiat Summer Chinook are thought to have originated from hatchery operations associated with the Grande Coulee Fish Maintenance Project (1939 to 1943), and Entiat Nation Fish Hatchery releases to the subbasin. The HSRG classifies this population as Stabilizing.
- Recovery Goal for Abundance: Not Applicable
- Productivity Improvement Expectation: Productivity is expected to increase over time as habitat actions designed to improve the abundance and productivity of ESA listed spring Chinook are implemented in the subbasin.
- Habitat Productivity and Capacity: Productivity: 1.69; Capacity: 300

2.2 Current Hatchery Programs Affecting this Population

No hatchery programs currently release summer/fall-run Chinook to the Entiat River. Relatively large numbers of out-of-basin strays (423) from the following hatchery programs may spawn in the subbasin:

- Methow Summer Chinook
- Okanogan Similkameen Summer Chinook
- Upper Middle Columbia Mainstem Summer Chinook (Turtle Rock Hatchery)
- Wenatchee Summer Chinook
- Upper Middle Columbia Summer Chinook (Wells Hatchery)

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 220 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.5 to 1.1. Average abundance of natural-origin spawners (NOS) would decrease from approximately 70 fish to approximately 19 fish. Harvest contribution of the natural and hatchery populations would go from approximately 87 fish to approximately 23 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with managers' goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have not assigned a population designation for the Entiat summer Chinook. No hatchery programs for summer Chinook operate in the subbasin. The Entiat River population appears to be composed of stray hatchery fish. Under current habitat and harvest conditions, no population would exist in the absence of these hatchery fish.

Recommendations

Due to the low productivity and capacity, the HSRG recommends that this population be managed as a Stabilizing population.

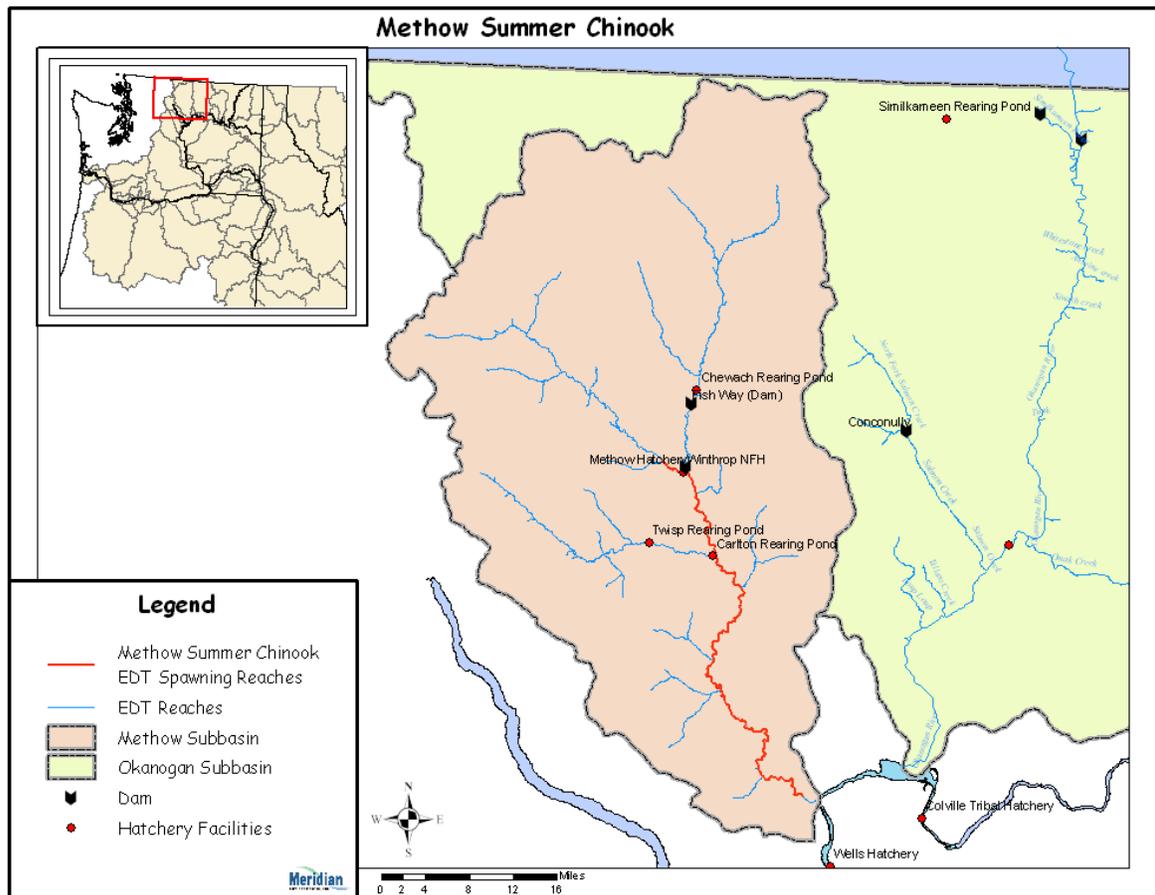
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Entiat Summer Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 72% | 0.00 | 70 | 0.5 | 87 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 19 | 1.1 | 23 | - |
| HSRG Solution | None None | - | 0% | 0% | 77% | 0.00 | 79 | 0.5 | 120 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 75% | 0.00 | 88 | 0.6 | 134 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Methow Summer Chinook Population and Related Hatchery Programs

January 31, 2009



1 Methow River Summer Chinook

Methow summer Chinook are considered part of the Upper Columbia River summer/fall-run Chinook ESU that includes all late-run summer and fall, ocean-type Chinook salmon in the mainstem Columbia River and its tributaries between Chief Joseph and McNary dams (excluding Marion Drain). NMFS concluded that at the time of their review, this larger ESU did not merit protection under ESA (NMFS 1995 and 50 CFR Parts 222, 226, and 227).

Methow summer Chinook are considered a unique stock based on their distinct spawning distribution, later river entry timing (July), spawn timing (September to November) and genetic composition. Most spawning occurs in the mainstem Methow River from the mouth to the Chewuch River (<http://wdfw.wa.gov/webmaps/salmonscape/sasi>).

This Chinook stock is genetically very divergent from all upper Columbia Basin spring Chinook populations. They are relatively similar to Wenatchee summer Chinook.

There is no reliable estimate of historical Methow summer Chinook production, as it is not clear these fish were present in the system. The stock is a mixture of native Chinook and Chinook from the Grande Coulee Fish Maintenance Project.

2 Current Conditions

Methow summer Chinook spawn in late September to early November in the mainstem Methow River from the confluence of the Chewuch River to the mouth of the Methow. From 1986 to 2003, adult run size to the Methow River has ranged from 332 to 4,630 fish. Average adult return for this period has been ~1,300 fish. In 2002, the WDFW rated this stock as Healthy.

The stock is considered a mixed stock with composite (hatchery and natural) production. Winthrop and Leavenworth National Fish hatcheries have in the past released Chinook salmon captured at Wells Dam to the Methow River. The Eastbank Hatchery still produces and releases juvenile summer Chinook to the Methow River each year.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Not Listed
- Population Description: Methow summer Chinook are thought to be mixture of native summer Chinook and Chinook from the Grande Coulee Fish Maintenance Project (1939 to 1943), which dispersed offspring of fish attempting to return to spawning grounds above Grand Coulee Dam into Upper Columbia tributaries below the dam.
- Recovery Goal for Abundance: Not Applicable
- Productivity Improvement Expectation: Productivity is expected to increase over time as habitat actions designed to improve the abundance and productivity of ESA listed spring Chinook are implemented in the subbasin.
- Habitat Productivity and Capacity: Productivity: 1,76 ; Capacity: 1,531

2.2 Current Hatchery Programs Affecting this Population

The primary hatchery program that is most likely to affect Methow summer-run Chinook is the Carlton Pond program. A brief description of this program is presented below.

Methow/Okanogan Summer Chinook (Me-Ok) (Carlton Pond): This integrated harvest program releases up to 400,000 (10-15 fpp) fish each year to the Methow River. Fish are acclimated prior to their release at Carlton Pond (Rkm 90.2). Fish are force-released at ~10 fpp from mid-April to mid-May from the Carlton Ponds. All fish released are mass-marked with an adipose fin-clip and coded-wire tag. An additional 576,000 fish of similar size are released outside of the subbasin in the Okanogan River subbasin (from Similkameen Pond). Adults for broodstock are collected at Wells Dam from the run at large and held/spawned at the Eastbank Hatchery. All incubation and juvenile rearing activities occur at this facility or at the two acclimation ponds (Carlton and Similkameen). Broodstock protocols for the Methow and Okanogan programs call for a goal of 100% of the hatchery broodstock to be collected from the natural run-at-large crossing Wells Dam; however, this has not been achieved. The average pNOB for brood years 1993 through 2005 (run-at-large) has been 0.56. The average PNI for this program is 0.45 (pHOS = 66%). The program has a recruit per spawner value of 4.0.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 657 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.5 to 1.1. Average abundance of natural-origin spawners (NOS) would decrease from approximately 271 fish to approximately 108 fish. Harvest contribution of the natural and hatchery populations would go from approximately 938 fish to approximately 149 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with managers' goals; however, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Managers have stated their goal for this program as; "Increase the abundance of the natural adult population of unlisted species, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity. In addition, provide harvest opportunities in years when spawning escapement is sufficient to support harvest" (goal statement adopted by Habitat Conservation Committee, Hatchery Sub-Committee). To achieve this managers have established a mitigation goal of 400,000 smolts for this program. The average release since 1989 has been 368,590 smolts. Managers have not assigned a population designation for the Methow summer Chinook. Managers are uncertain whether or not the Methow historically supported an independent population of summer Chinook. It is being managed as an integrated population based on an aggregate of fish returning above Wells Dam. Under current conditions, this population does not meet the standards for a Primary or Contributing population.

Current management does not allow any population structure above Wells Dam. Current management is to collect broodstock at Wells Dam comprised of an unknown mixture of natural-origin adults from the Methow, Okanogan and mainstem Columbia rivers. A proportion of this aggregate broodstock is released into the Methow River. Fish released into all tributaries are the progeny of 100% natural-origin adults comprising this aggregate broodstock. Smolt-to-adult returns in the Methow River average approximately one-third of the return rates of progeny from the same broodstock source released in the Okanogan River. The cause of this major difference is unknown. We note that a disproportional number of high BKD titer juveniles are used in the Methow program. There are no means to manage the composition of hatchery and natural-origin adult summer Chinook on the spawning grounds. Currently, hatchery-origin adults comprise approximately 66 % of the naturally-spawning population of summer Chinook in the Methow River.

At current harvest rates and existing productivity and capacity levels, it does not appear that Methow summer Chinook can be a self-sustaining population. In fact, there would be no natural spawning component present without the support of the hatchery program. An effective integrated program cannot be operated here under current conditions.

No fisheries are currently selective on summer Chinook. There appears to be an opportunity to use this method to remove hatchery fish, provide additional harvest opportunities, and improve productivity of the population.

Recommendations

The HSRG recommends that managers prioritize analysis of genetic data collected to help determine the population structure of summer Chinook in the upper Columbia River Basin. Managers need to clearly define the overall summer/fall Chinook population structure above Rocky Reach Dam to maintain or increase abundance, productivity and diversity of these populations.

If it is determined that summer Chinook returning to the Methow River is a distinct population, the HSRG recommends that broodstock management strategies be implemented to meet the standards of a Contributing or Primary population. This would require an ability to collect fish returning to the Methow River, control hatchery fish on the spawning grounds, and reduce harvest rates on natural-origin fish to allow a self-sustaining population to exist. However, under the current habitat conditions, accomplishing this will require significant reductions in harvest rates and removal of hatchery strays. This would still result in a relatively small population (less than 200 natural-origin fish).

In order to improve the viability and productivity of natural upper Columbia River summer Chinook populations, the HSRG recommends immediate management of all freshwater sport fisheries as selective fisheries. The Colville Tribes' growing cultural and subsistence fishery should continue to develop its selective capacity. Research on selective gear for the commercial fishery should commence immediately.

The HSRG also recommends that fishery managers immediately review the capacity of upper Columbia River summer Chinook populations to tolerate current and future high exploitation rates and adopt fisheries management and hatchery production strategies that are compatible with species conservation and survival.

If it is determined that fish returning to the Methow River are not a distinct population but rather a component of the mainstem spawning aggregate, the HSRG recommends that the Methow could be considered a Stabilizing population and managed as a component of the Wells Hatchery program.

We encourage managers to investigate the reasons for poor survival of the Carlton Pond releases. We also encourage managers to consider collecting broodstock from throughout the full run, at least into mid-October.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood

fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

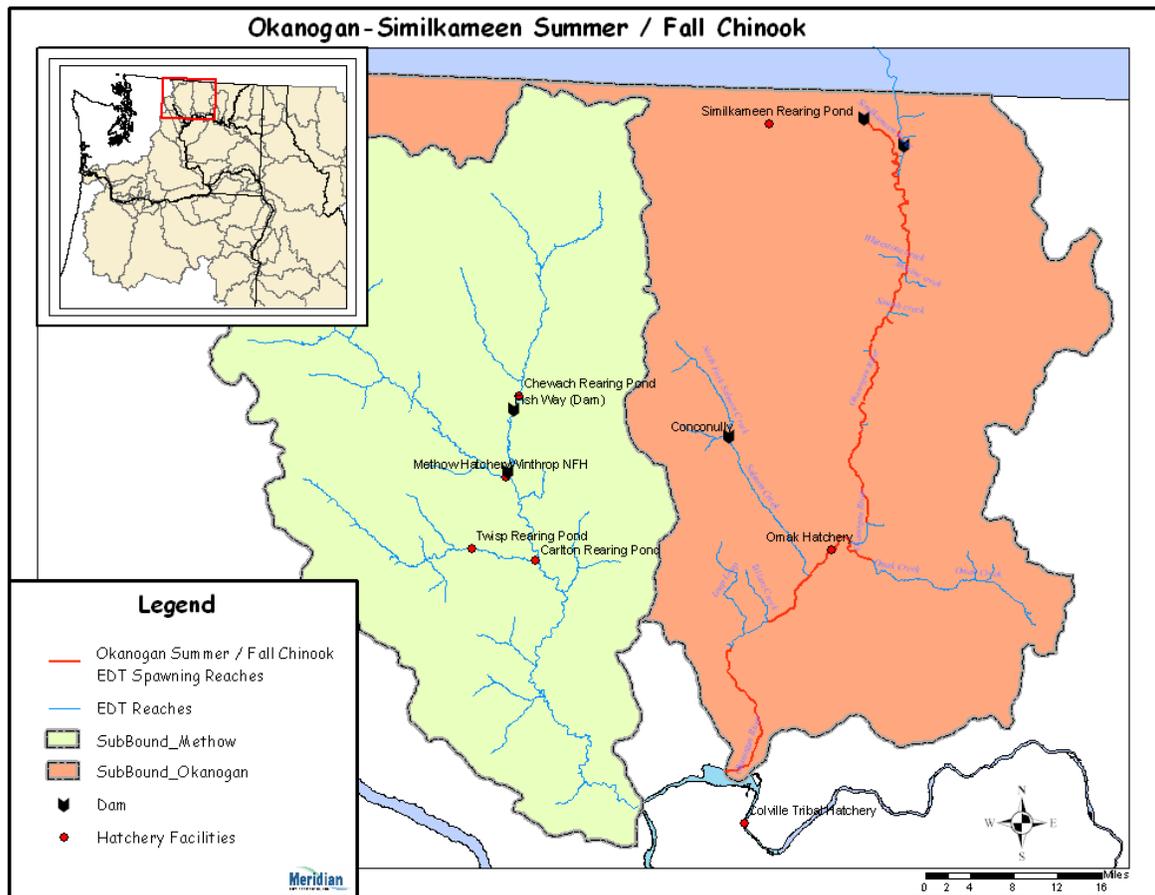
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Methow Summer Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 66% | 0.00 | 271 | 0.5 | 375 | - |
| | Seg Harv | 340.8 | 0% | | | | | | 563 | - |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 108 | 1.1 | 149 | - |
| HSRG Solution | None None | - | 0% | 0% | 64% | 0.00 | 299 | 0.6 | 441 | - |
| | Seg Harv | 340.8 | 0% | | | | | | 647 | - |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 61% | 0.00 | 337 | 0.6 | 497 | - |
| | Seg Harv | 340.8 | 0% | | | | | | 647 | - |

Hatchery Scientific Review Group Review and Recommendations

Okanogan Summer Chinook Population and Related Hatchery Programs

January 31, 2009



1 Okanogan River Summer Chinook

Okanogan summer Chinook are considered part of the Upper Columbia River summer/fall-run Chinook ESU that includes all late-run summer and fall, ocean-type Chinook salmon that are present in the mainstem Columbia River and its tributaries between Chief Joseph and McNary Dams (excluding Marion Drain). NMFS concluded that at the time of their review, this larger ESU did not merit protection under ESA (NMFS 1995 and 50 CFR Parts 222, 226, and 227).

Okanogan summer Chinook were identified as a stock based on their distinct spawning distribution, later river entry timing (July to September), spawn timing (October to November) and genetic composition. Historically, adult spawning likely occurred throughout the mainstem Okanogan and major tributaries. Summer Chinook from the Similkameen River, a major Okanogan River tributary, sampled from 1991 to 1993 were significantly different from other upper Columbia summer Chinook stocks. (<http://wdfw.wa.gov/webmaps/salmonscape/sasi>).

2 Current Conditions

Okanogan summer Chinook spawn from early October to mid-November in the mainstem Okanogan River from RM 40.3 (Riverside) to Zosel Dam (Colville Tribe 2004). Spawmed-out adult carcasses have also been found in the Similkameen River and in Canada above Lake Osoyoos. From 1992 to 2003, adult runs to the Okanogan River have ranged from 341 to 13,857 fish. The run consists of both hatchery- and natural-origin adults. In 2002, the WDFW rated this stock as Healthy (<http://wdfw.wa.gov/webmaps/salmonscape/sasi>).

The stock is considered to be mixed with composite (hatchery and natural) production. The Eastbank Hatchery still produces and releases juvenile summer Chinook to the Okanogan River each year. Fish are reared at the Eastbank Hatchery and then transferred to the Similkameen Acclimation Pond for release. Broodstock consists primarily of Methow River and Okanogan River adults.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Not Listed
- Population Description: Okanogan Summer Chinook consist of a composite population of hatchery and natural-origin adults from the Methow and Okanogan Rivers.
- Recovery Goal for Abundance: Not Applicable
- Productivity Improvement Expectation: Productivity is expected to increase over time as habitat and hatchery actions designed to improve the abundance and productivity of ESA listed steelhead are implemented in the subbasin.
- Habitat Productivity and Capacity: Productivity: 6.0 ; Capacity: 10,000

2.2 Current Hatchery Programs Affecting this Population

The primary hatchery program that is currently affecting Okanogan summer-run Chinook is the Methow/Okanogan Summer Chinook (Me-Ok) (Similkameen Pond) program. A brief description of this program is presented below.

Methow/Okanogan Summer Chinook (Similkameen Pond): This integrated harvest program releases up to 576,000 (10-15 fpp) fish each year to the Similkameen River (Okanogan River tributary). Fish are acclimated prior to their release at Similkameen Pond (Rkm 5.0), and then volitionally released for two weeks before being forced from the pond. Release occurs from mid-April to mid-May with fish at ~ 10 fpp. All fish released are mass-marked with an adipose clip and coded-wire tag. Similkameen Pond has had difficulties meeting its goals due to a variety of disease (cold-water, BKD, Ich) and water quality problems. Water quality issues include water temperature, pollution and heavy loads of sediment. Adults for broodstock are collected at Wells Dam from the run-at-large and held/spawned at the Eastbank Hatchery. All incubation and juvenile rearing activities occur at this facility or at the two acclimation sites (Carlton Pond, Methow River) and Similkameen. The R/S value for the Similkameen Hatchery program is 17.0. An additional 400,000 fish of similar size are released in the Methow River subbasin, where juveniles are acclimated at the Carlton Acclimation Ponds. Broodstock protocols for the Methow and Okanogan programs call for 100% of the hatchery broodstock to be collected from the natural run-at-large crossing Wells Dam. The average pNOB for brood years 1993 through 2005 (run-at-large) has been 0.56. The average PNI for this period was 0.60 (this program).

The Chief Joseph Hatchery Master Plan (Colville Tribes 2004) calls for the development of a locally-adapted broodstock of Okanogan River summer Chinook. To achieve this objective, the Colville Tribe will be constructing Chief Joseph Hatchery adjacent to Chief Joseph Dam on the Columbia River. The program will produce 1.1 million juveniles for conservation purposes and 900,000 for harvest (both will be integrated programs). Both yearling and sub-yearling juveniles will be released into the subbasin. All incubation and rearing activities will occur at Chief Joseph Hatchery and acclimation ponds (Riverside, Omak, St. Mary's Mission Pond, Ellisforde Pond and Bonaparte) located on or near the Okanogan River. Live-capture techniques will be used to collect the adult fish needed for hatchery broodstock.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 2,475 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 109 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than

0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.4 to 3.4. Average abundance of natural-origin spawners (NOS) would increase from approximately 3,483 fish to approximately 4,549 fish. Harvest contribution of the natural and hatchery populations would go from approximately 10,227 fish to approximately 7,585 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with managers' goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Managers have stated their goal for this program as; "Increase the abundance of the natural adult population of unlisted species, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity. In addition, provide harvest opportunities in years when spawning escapement is sufficient to support harvest." (Goal statement adopted by Habitat Conservation Committee, Hatchery Sub-Committee) To achieve this managers have established a mitigation goal of 576,000 smolts for this program. The average release since 1989 has been 491,336 smolts. Managers have not assigned a population designation for the Okanogan summer Chinook. It is being managed as an integrated population based on an aggregate of fish returning above Wells Dam. This population could meet the standards for a Primary population; however, current practices do not allow for the management of specific populations of summer Chinook upstream of Wells Dam. Currently, the program collects broodstock from the east ladder at Wells Dam (predominantly natural-origin adults of Methow, Okanogan and mainstem Columbia River

origin). Adults are transferred to the Eastbank Hatchery, where spawning, incubation, and early rearing occur. The release objective for the program is 576,000 smolts. Presmolts are transferred from the Eastbank Hatchery to an acclimation facility on the Similkameen River (in the Okanogan system). Smolts are released in the spring following an over-winter acclimation period. Between 1992 and 2003, the average spawning escapement for the Okanogan and Similkameen rivers averaged 4,288 adults (with a range between 473 and 13,857 fish). The estimated smolt-to-adult return rate for this program is 0.9%, approximately three times higher than that observed for the Methow River summer Chinook program.

Currently, there is no ability to manage the composition of adult summer Chinook on the spawning grounds within the Okanogan system; however, the Colville Tribes are testing selective adult capture gear to target hatchery-origin fish and to collect broodstock. The estimated proportion of hatchery-origin adults in spawning areas (pHOS) averages 37 % and has ranged between 22% and 70%.

No fisheries are currently selective on summer Chinook. There appears to be an opportunity to use this method to remove hatchery fish, provide additional harvest opportunities, and improve productivity of the population.

Recommendations

A program of the current size (576,000 smolts) could be operated as an integrated program consistent with the standards of a Primary population (PNI greater than 0.67). This would require collecting broodstock throughout the full run timing from fish returning to the Okanogan system instead of at Wells Dam. There are multiple options to accomplish this. For example, one option is managing pNOB at 50%, a pHOS target of approximately 25%, which would require removing at least 50% of returning hatchery fish.

A larger integrated program, also consistent with the standards of a Primary population, is possible if pNOB could be increased or pHOS could be further reduced.

In order to improve the viability and productivity of natural upper Columbia River summer Chinook populations, the HSRG recommends immediate management of all freshwater sport fisheries as selective fisheries. The Colville Tribes' growing cultural and subsistence fishery should continue to develop its selective capacity. Research on selective gear for the commercial fishery should commence immediately.

The HSRG also recommends that fishery managers immediately review the capacity of upper Columbia River summer Chinook populations to tolerate current and future high exploitation rates and adopt fisheries management and hatchery production strategies that are compatible with species conservation and survival.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-

disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

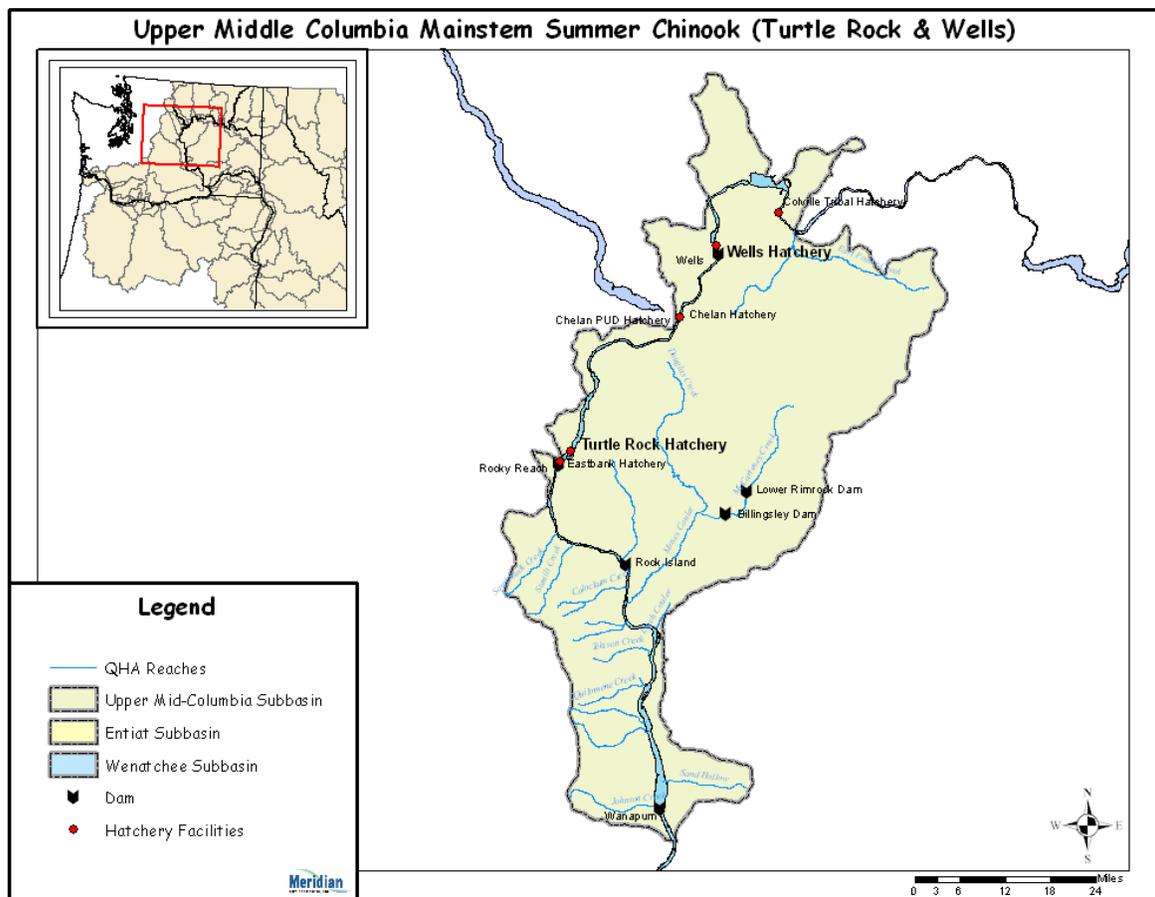
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Okanogan Summer Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 574.1 | 0% | 0% | 37% | 0.60 | 3,483 | 2.4 | 10,227 | - |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 4,549 | 3.4 | 7,585 | - |
| HSRG Solution | Int Both | 911.2 | 40% | 0% | 29% | 0.69 | 4,578 | 3.2 | 15,388 | 1,254 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Both | 911.2 | 40% | 0% | 26% | 0.72 | 5,264 | 3.6 | 16,388 | 1,254 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Upper Middle Columbia Mainstem Hatchery Summer Chinook Population and Related Hatchery Programs

January 31, 2009



1 1 Upper Middle Columbia Mainstem Hatchery Summer Chinook

The Upper Middle Columbia Mainstem Hatchery Summer Chinook population is a hatchery population that is not included as part of the Upper Columbia Summer/Fall-run Chinook ESU. This population has no viability or recovery goals. The population includes hatchery-origin fish from the Wells and Turtle Rock hatchery programs.

2 Current Conditions

The program collects hatchery-origin adult summer Chinook at Wells Hatchery (near Wells Dam). Broodstock consists primarily of hatchery-origin adults, but some natural-origin fish have been collected. The primary consideration in broodstock collection is to achieve a minimum escapement of 2,000 adults and jacks past Wells Dam each year. If adult escapement targets are not achieved, hatchery production would be curtailed or eliminated. Marked strays from hatchery programs outside of the mid-Columbia are not used as hatchery broodstock when it appears that the percentage of strays exceeds 5% of broodstock. The program has a release goal of 840,000 juvenile summer Chinook from Wells Hatchery and 1.278 million juveniles from Turtle Rock Hatchery.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for this hatchery population.

- ESA Status: Not Listed
- Population Description: These are segregated harvest programs that are maintained through the collection of hatchery-origin adults at Wells Dam.
- Recovery Goal for Abundance: Not Applicable
- Productivity Improvement Expectation: Not Applicable
- Habitat Productivity and Capacity:
Mainstem population: Productivity: 5.0; Capacity: 6,000
Wells Hatchery population: Productivity: 0; Capacity: 0

2.2 Current Hatchery Programs Affecting this Population

Two primary hatchery programs make up this population. Each is briefly described below.

1. Wells Hatchery Summer Chinook: The program is described as an integrated harvest type designed to mitigate for the effects of Wells Dam operations on fisheries. The program releases 840,000 juvenile summer Chinook. The release includes 320,000 yearling at 10 fpp (R/S of 16.5) and 484,000 sub-yearlings (242,000 at 50 fpp, R/S of 1.2 and 242,000 at 25 fpp, R/S unknown to date). Fish are reared on a seasonally varying combination of ground water and river water and released volitionally to the Columbia River. All released fish are mass-marked. Incubation and rearing activities are performed on-station. Broodstock are collected from fish entering the facility ladder (77% of total) and at Wells Dam (east ladder).
2. Turtle Rock via Wells Hatchery: This program is defined as a segregated harvest program, with a production goal of 1.078 million sub-yearlings and 200,000 yearlings (8 fpp). Included in the sub-yearling release is a group of 450,000

accelerated sub-yearlings that are reared at the Eastbank Hatchery and force-released from the Turtle Rock Hatchery when they reach 25 fpp. Non-accelerated sub-yearlings (628,000 fish release) are transferred as emergent fry to Eastbank Hatchery rearing units. They are then transferred as unfed fry to the Turtle Rock annex facility where they are reared to 80 fpp. In early May, they are transferred to the Turtle Rock Island facility for final rearing and are force-released in early July at approximately 55 fpp. For the yearling production, emergent fry are transferred and reared at the Rocky Reach Annex rearing units to ~ 40-50 fpp, transferred in late October to the Turtle Rock Island facility where they are reared from late October to April, and then force-released in mid-April at ~8 fpp. All yearling fish are mass-marked (coded wire-tagged and adipose fin-clipped); 200,000 from each of the sub-yearling groups are marked (coded wire-tagged and adipose fin-clipped); the remainder are given only an adipose clip. The average weighted recruits per spawner value for the sub-yearling and yearling program combined is 4.1. Broodstock for the program are collected at Wells Hatchery.

Broodstock protocols for both the Wells Hatchery and Turtle Rock Hatchery programs call for 10% of the hatchery broodstock to be natural origin fish.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated programs: 0 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 1,270 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.3 to 2.8. Average abundance of natural-origin spawners (NOS) would increase from approximately 1,372 fish to approximately 2,394 fish. Harvest contribution of the natural and hatchery populations would go from approximately 6,232 fish to approximately 3,908 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with managers' goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have not assigned a population designation for the mainstem Columbia summer Chinook. The Managers have stated their goal for this program as: "Increase the abundance of the natural adult population of unlisted species, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity. In addition, provide harvest opportunities in years when spawning escapement is sufficient to support harvest" (goal statement adopted by Habitat Conservation Committee, Hatchery Sub-Committee). To achieve this goal, managers have established a mitigation goal of approximately 2 million smolts (combined programs described below). Chinook have been observed spawning in the mainstem upstream of Rocky Reach Dam although little is known about the abundance, productivity or composition of this population. Anecdotal information of spawning below Wells Dam Hatchery, Chief Joseph Dam, and mainstem spawning was provided by the managers, but the magnitude is unknown. Under current conditions, we cannot assess whether this population meets the standards for a Primary or Contributing population.

This population is being managed as an integrated population (10% pNOB) based on an aggregate of fish returning above Wells Dam. Currently, adult composition on the spawning grounds is not being managed. Broodstock for the Wells and Turtle Rock programs is collected at Wells Hatchery from mid-July through early September. There are no adult collection facilities at the Turtle Rock release site. The current production reared and released at Wells Hatchery consists of 320,000 yearlings and 484,000 sub-yearlings which are all adipose fin-marked with a portion coded wire-tagged. In addition, 200,000 yearlings and 1,100,000 sub-yearlings are reared and released at Turtle Rock. All Turtle Rock yearlings are marked and coded wire-tagged, but only a portion of the sub-yearlings (200,000) are marked and tagged. Future plans for Turtle Rock production are to transition from subyearlings to 600,000 yearlings, to be acclimated and released at the confluence of the Chelan and Columbia rivers.

No fisheries are currently selective on summer Chinook. There appears to be an opportunity to use this method to remove hatchery fish, provide additional harvest opportunities, and improve productivity of the population.

Recommendations

The HSRG recommends that managers prioritize analysis of previously collected genetic data to help determine if the mainstem spawning aggregate is a distinct population of summer/fall Chinook in the upper Columbia River Basin. Managers need to clearly define the overall summer/fall Chinook population structure above Rocky Reach Dam to maintain or increase abundance, productivity and diversity of these populations. The HSRG identified two potential options for managing the Wells on-station and Turtle Rock/Chelan programs depending upon the designation of the mainstem spawning component:

1) If the mainstem spawning aggregate is not considered a distinct population, the Wells on-station program could be managed as a segregated population and provide broodstock for the Turtle Rock/Chelan releases. The Wells and Turtle Rock/Chelan programs would be based on hatchery-origin fish returning to Wells and would need to be segregated from the distinct population(s) above Wells Dam.

2) If the mainstem spawning aggregate is a distinct population, then the Wells on-station program should be managed as an integrated program. This requires an assessment of potential productivity and capacity of natural-origin mainstem spawners. This information should be used to develop appropriate PNI values consistent with the standards for a Contributing or Primary population. Broodstock for the Wells on-station release should be collected throughout the run and should be managed consistent with the population designation. Broodstock for the Turtle Rock/Chelan could be derived from excess hatchery fish returning on-station to Wells. This would be possible only after the proposed conversion from sub-yearlings to yearlings and the resulting reduction in broodstock needs at the Turtle Rock/Chelan release site.

In order to reduce the potential for straying, adult collection capabilities should be included in the proposed program at Chelan River. In addition, managers should monitor straying from the proposed Chelan program.

Managers should consider collecting broodstock from throughout the fall run, at least into mid-October. Prior to the transition from Turtle Rock releases to Chelan, the entire release at Turtle Rock should be adipose fin-clipped.

In order to improve the viability and productivity of natural upper Columbia River summer Chinook populations, the HSRG recommends immediate management of all freshwater sport fisheries as selective fisheries. The Colville Tribes' growing cultural and subsistence fishery should continue to develop its selective capacity. Research on selective gear for the commercial fishery should commence immediately.

The HSRG also recommends that fishery managers immediately review the capacity of upper Columbia River summer Chinook populations to tolerate current and future high exploitation rates and adopt fisheries management and hatchery production strategies that are compatible with species conservation and survival.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very

least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

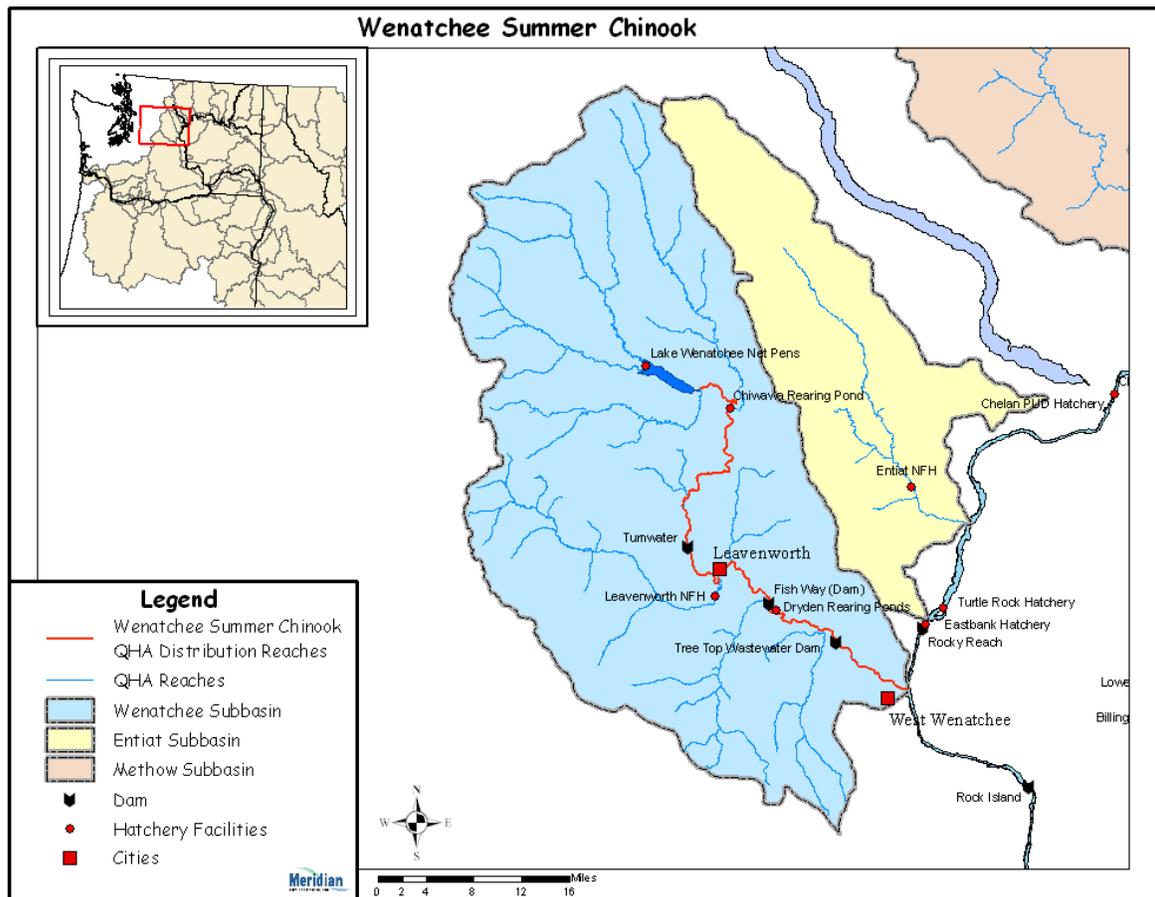
Table 1. Results of HSRG analysis of current condition and HSRG Solution for the Upper Middle Columbia Summer Chinook Hatchery Population. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-----------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 43% | 0.00 | 1,372 | 1.3 | 2,240 | - |
| | Wells Seg Harv | 803.0 | 45% | | | | | | 2,365 | 95 |
| | Turtle Rock/Chelan Seg Harv | 1,277.9 | 0% | | | | | | 1,627 | - |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 2,394 | 2.8 | 3,908 | - |
| HSRG Solution | Int Both | 803.0 | 80% | 0% | 43% | 0.54 | 2,231 | 2.2 | 6,496 | 337 |
| | Wells Seg Harv | - | 0% | | | | | | - | 0 |
| | Turtle Rock/Chelan Seg Harv | 600.4 | 0% | | | | | | 5,171 | 0 |
| HSRG Solution w/ Improved Habitat | Int Both | 803.0 | 80% | 0% | 39% | 0.56 | 2,590 | 2.4 | 7,012 | 337 |
| | Wells Seg Harv | - | 0% | | | | | | - | 0 |
| | Turtle Rock/Chelan Seg Harv | 600.4 | 0% | | | | | | 5,171 | 0 |

Hatchery Scientific Review Group Review and Recommendations

Wenatchee Summer Chinook Population and Related Hatchery Programs

January 31, 2009



1 Wenatchee River Summer Chinook

Wenatchee summer Chinook are considered part of the Upper Columbia River summer/fall-run Chinook ESU that includes all late-run summer and fall, ocean-type Chinook salmon that are present in the mainstem Columbia River and its tributaries between Chief Joseph and McNary dams (excluding Marion Drain). NMFS concluded that at the time of their review, this larger ESU did not merit protection under ESA (NMFS 1995 and 50 CFR Parts 222, 226, and 227). Current distribution is shown in the map above.

Historical Chinook runs to the Wenatchee River were about 41,000 fish; however, the proportion that were summer/fall-run Chinook (late-run) is not known (UCSRB 2007). Late-run Chinook historically used the mainstem of the Wenatchee River, from its mouth to Lake Wenatchee. Tumwater Dam (RM 32.7) and Dryden Dam (RM 17.6) on the Wenatchee River are thought to have been partial obstacles to upstream passage of adults before 1957 (NPPC 2004).

2 Current Conditions

Wenatchee summer Chinook are thought to be mixture of native summer Chinook and Chinook from the Grande Coulee Fish Maintenance Project (1939 to 1943), which dispersed offspring of fish attempting to return to spawning grounds above Grand Coulee Dam into Upper Columbia tributaries below the dam. A Wenatchee summer Chinook stock has been maintained at the WDFW Eastbank Hatchery since 1989. Yearling smolts are acclimated in the Dryden Acclimation Pond and released into the Wenatchee River.

Late-run Chinook can be found spawning in the Wenatchee River from RM 1.0 to Lake Wenatchee RM 54. It has been reported that since the early 1960s, the number of redds have decreased downstream of Dryden Dam (RM 17.5) and increased upstream of Tumwater Dam (RM 32.7) (NPPC 2004). The highest densities of redds are found near the City of Leavenworth (RM 23.9 to 26.4) and in the Tumwater Canyon (RM 26.4 to 35.6). Summer Chinook spawn in September and October.

The 10-year average summer-run Chinook adult counts at Rock Island Dam are approximately 46,000 fish, counts which both hatchery-origin and natural-origin adults and fish returning to multiple rivers. Based on redd counts, Wenatchee summer Chinook abundance ranged from about 4,000 to 9,100 from 1996 to 2001. According to the results of carcass surveys, adult escapement to the Wenatchee River consists primarily of naturally-produced fish.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Not Listed
- Population Description: Wenatchee summer Chinook are thought to be mixture of native summer Chinook and Chinook from the Grande Coulee Fish Maintenance Project (1939 to 1943), which dispersed offspring of fish attempting to return to spawning grounds above Grand Coulee Dam into Upper Columbia tributaries below the dam.
- Recovery Goal for Abundance: Not Applicable

- Productivity Improvement Expectation: Increase over time as habitat actions designed to improve the abundance and productivity of ESA listed spring Chinook are implemented.
- Habitat Productivity and Capacity: Productivity: 4.25; Capacity: 13,360

2.2 Current Hatchery Programs Affecting this Population

The primary hatchery program that is most likely to affect Wenatchee summer-run Chinook is the Dryden Pond program. A brief description of this program is presented below.

Wenatchee Summer Chinook (Dryden Pond): This integrated conservation program releases a maximum of 864,000 smolts (720,000 recent average) (10 fpp-yearlings) starting in mid-April. Fish are reared at the Eastbank Fish Hatchery on well-water and then transferred in the spring to Dryden Pond for acclimation and release to the Wenatchee River (Rkm 26.0). Both NOR and HOR adults are collected at the left and right bank Dryden traps and Tumwater Dam trapping facility and transported to the Eastbank Hatchery. The program has a recruit per spawner value of 9.8.

The number of hatchery adult strays (referred to as internal or in-basin) from the Dryden Pond program spawning with natural-origin Wenatchee Summer-run Chinook is estimated at 2,193 fish. Hatchery adults from the following programs are assumed to stray to the Wenatchee River system and possibly spawn with native late-run Chinook:

- Methow Summer Chinook
- Okanogan-Similkameen Summer Chinook
- Upper Middle Columbia-Mainstem Summer Chinook (Turtle Rock)
- Upper Middle Columbia-Mainstem Columbia Summer Chinook (Wells)

Adult strays from these programs are defined as external strays (out-of-subbasin) in AHA population modeling. It is estimated that 233 external hatchery fish from these programs affect Wenatchee summer Chinook.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with

the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.3 to 2.8. Average abundance of natural-origin spawners (NOS) would increase from approximately 5,321 fish to approximately 6,338 fish. Harvest contribution of the natural and hatchery populations would decrease from approximately 9,794 fish to approximately 7,805 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with managers' goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have not assigned a population designation for the Wenatchee summer Chinook. The current program is consistent with the standards for a Primary population. This integrated conservation program releases a maximum of 864,000 smolts (10 fpp-yearlings) starting in mid-April. The Managers have stated their goal for this program as; "Increase the abundance of the natural adult population of unlisted species, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity. In addition, provide harvest opportunities in years when spawning escapement is sufficient to support harvest." (Goal statement adopted by Habitat Conservation Plan Committee, Hatchery Sub-Committee). Broodstock is collected at Dryden and Tumwater dams and is nearly 100% natural-origin. The natural population seems to be robust and healthy and provides substantial harvest benefits. The lower river spawning (near Dryden) is comprised of greater than 50% hatchery-origin spawners; however, the highest density of redds is found higher in the basin near Leavenworth and above Tumwater Canyon. Overall, the percent of hatchery-origin spawners is approximately 20%. Approximately 15% of the returns from this program are reported to spawn outside the subbasin.

Numerous fish infected with *Saprolegnia* sp. (fungus) were observed in Dryden Pond. Managers indicated that this has been observed frequently and occurs shortly before release.

All fish are adipose fin-clipped and coded wire-tagged.

No fisheries are currently selective on summer Chinook. There appears to be an opportunity to use this method to remove hatchery fish, provide additional harvest opportunities, and improve productivity of the population.

Recommendations

The HSRG recommends that managers prioritize analysis of genetic data collected to determine the population structure of summer Chinook in the upper Columbia River Basin.

The HSRG has no specific recommendations to improve upon the broodstock management protocols for this program. To address the fungus problem, managers should accelerate release dates, allow volitional release of early migrating smolts and/or implement other protocols to ensure production of healthy fish.

In order to improve the viability and productivity of natural upper Columbia River summer Chinook populations, the HSRG recommends immediate management of all freshwater sport fisheries as selective fisheries. The Colville Tribes' growing cultural and subsistence fishery should continue to develop its selective capacity. Research on selective gear for the commercial fishery should commence immediately.

The HSRG also recommends that fishery managers immediately review the capacity of upper Columbia River summer Chinook populations to tolerate current and future high exploitation rates and adopt fisheries management and hatchery production strategies that are compatible with species conservation and survival.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

No fisheries are currently selective on summer Chinook, and there appears to be an opportunity to use this method to remove hatchery fish, improve productivity of the population and provide additional harvest opportunities in the Wenatchee River.

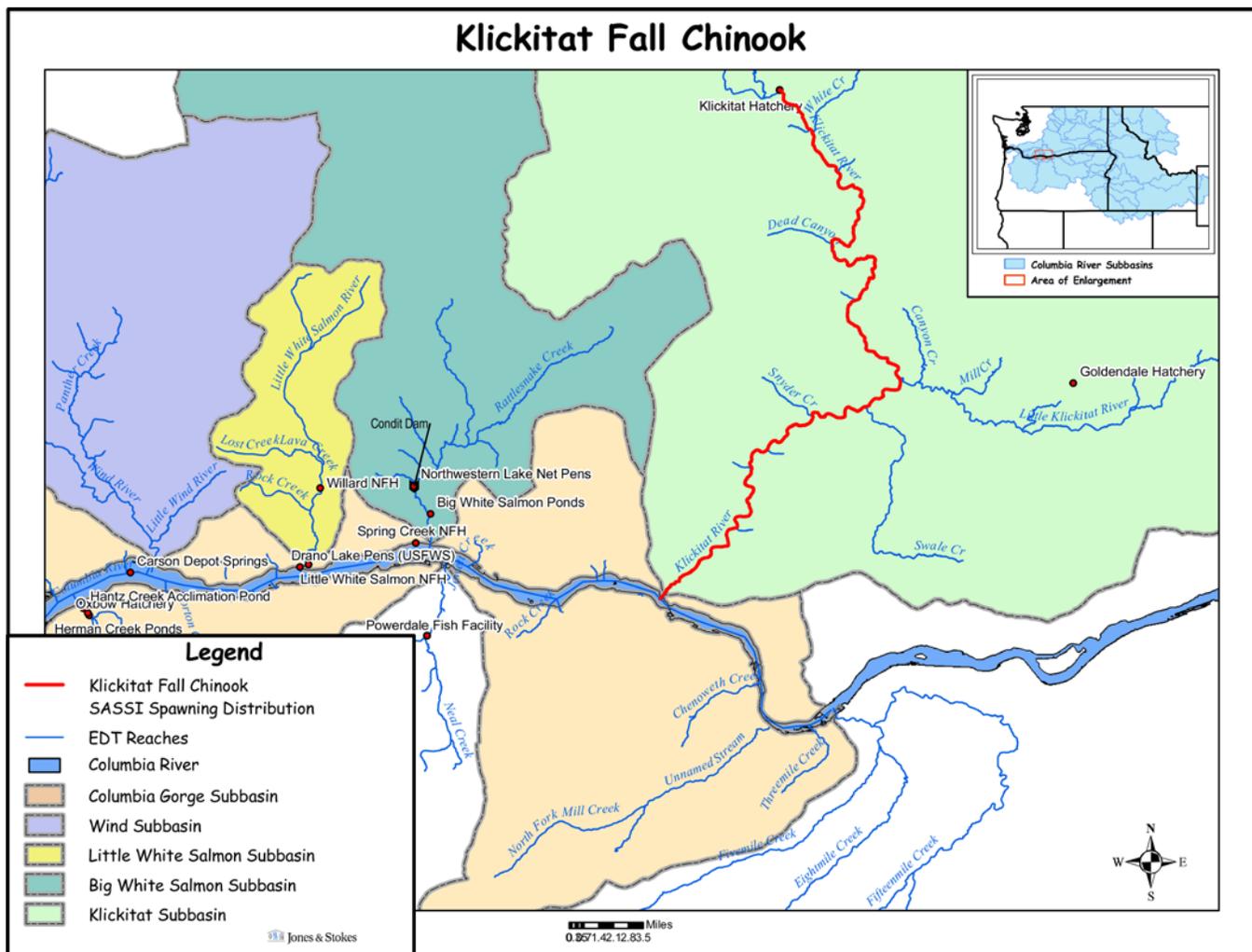
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Wenatchee Summer Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 737.1 | 1% | 0% | 27% | 0.79 | 5,321 | 2.3 | 9,794 | 18 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 6,338 | 2.8 | 7,805 | - |
| HSRG Solution | Int Both | 737.1 | 1% | 0% | 25% | 0.80 | 5,402 | 2.4 | 11,706 | 15 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Both | 737.1 | 1% | 0% | 22% | 0.82 | 6,291 | 2.7 | 12,955 | 15 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Klickitat Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Klickitat Fall Chinook

Fall Chinook are not native to the Klickitat subbasin upstream of Lyle Falls, but natural escapement of fall Chinook has been observed from previous tule fall Chinook releases and the more recent URB releases. Also, a summer returning Chinook component has been observed in both terminal fisheries and during spawner surveys. Preliminary genetic data from the summer-run component suggests a close relationship to the up-river Columbia Basin summer-run Chinook populations.

Lower Columbia tules were first released in the Klickitat in 1971. Releases were terminated in 1986 in favor of an upriver bright (URB) Fall Chinook program. Spawner surveys conducted by WDFW show an average fall Chinook escapement range of 400 to over 10,000 from 1986-2002. Spawning is concentrated upstream of the Twin Bridges at the Klickitat's confluence with the Columbia River up to the Klickitat Hatchery at RM 42. Spawning occurs primarily in November.

Genetic analysis of naturally spawning Klickitat fall Chinook sampled from 1991 to 1994 showed them to be very similar genetically to URB Chinook at Priest Rapids Hatchery and in the Hanford Reach. They were also closely associated with URB populations at Bonneville and Little White Salmon hatcheries and in the Yakima River (Marshall 2000; Klickitat Fall Chinook HGMP 2005).

Low flows over Lyle Falls (RM 2) are believed to have acted as a barrier to migration of fall Chinook in the past. In 1952 two fishways were constructed at the Falls to improve fish passage, giving fall Chinook returning to the Klickitat Hatchery, as well as out-of-basin strays, access to historically unavailable spawning grounds.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Naturally spawning fall Chinook in the Klickitat system are not included as part of any ESU and so are not listed under the ESA.
- Population Designation: Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette results in a designation of Stabilizing.
- Current Viability Rating: Unknown.
- Recovery Goal for Abundance: Unknown.
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (from EDT): Productivity 5.4; Capacity 5,356.

2.2 Current Hatchery Programs Affecting this Population

After its construction in 1952, the Klickitat Hatchery produced tule stock fall Chinook until 1986, when production was switched to URB stock. Currently, broodstock are collected and spawned at the Priest Rapids Hatchery. Up to 4,500,000 eyed eggs are transferred to the Klickitat Hatchery for an intended release of 4,000,000 fingerlings. Yearly releases from 1996 to 2004 averaged 3,353,000 fish (ranging from 520,000 to 4,387,000), at an average size of 67 fish per pound (ranging from 79 to 55 fish per pound).

After the closing of the east bank ladder at Priest Rapids, the number of natural fish included in the broodstock is reported to have dropped dramatically. It is believed that more natural fish swim the eastern shore near the Priest Rapids Hatchery and that by collecting fish from the western shore, fewer naturally produced fish will be included in the collection. The number of naturally produced fish included in the broodstock is currently unknown, because so much of the fall Chinook production in the Columbia Basin is unmarked and broodstock are collected from the run-at-large volunteering to the Priest Rapids Hatchery (Klickitat Fall Chinook HGMP 2005).

Straying to the Snake River has been a major concern and 16.25% (approximately 650,000) of the Klickitat release is coded-wire tagged (per US v. Oregon) in order to better determine the source of Chinook passing Ice Harbor Dam on the Snake River. Beginning in brood year 2007, the URB brood source is from the Little White Salmon River.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: NA.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 5,897 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.7 to 1.5. Average abundance of natural-origin spawners (NOS) would decrease from 910 to 491. Harvest contribution of the natural and hatchery populations would go from 19,960 to 1,351.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Fall Chinook are not native to the Klickitat subbasin upstream of Lyle Falls and there are no natural production objectives. The purpose of the URB fall Chinook program is to produce fish for harvest. The current goal is to maintain recent harvest levels across all fisheries. Broodstock for this program is from out-of-basin hatchery programs (previously from Priest Rapids, and beginning in 2007, using Little White Salmon URBs). The infrastructure does not exist to collect broodstock returning to the Klickitat River.

This program has potential ecological effects, because fall Chinook are non- native and because of the current release location and the size of program. This stock also has been known to stray outside the basin. There may be opportunities to reduce these ecological risks, reduce straying, and improve contribution to fisheries.

The presence of naturally spawning summer-run Chinook may provide managers a future opportunity to convert a portion of the URB fall Chinook hatchery production to a summer Chinook program.

Recommendations

To reduce the ecological effects of this program, managers could consider moving towards broodstock collection from returns to the basin and developing in-basin infrastructure in the lower river to acclimate all fall Chinook prior to release. All hatchery fall Chinook should be externally marked and a portion of the release coded-wire tagged to monitor performance of the program and evaluate stray rates. Together, these measures should result in improved survival, reduced ecological effects, better homing, and improved contribution to fisheries. Managers may be able to reduce the size of the program and still achieve harvest objectives, if survival increases as expected.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-

disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

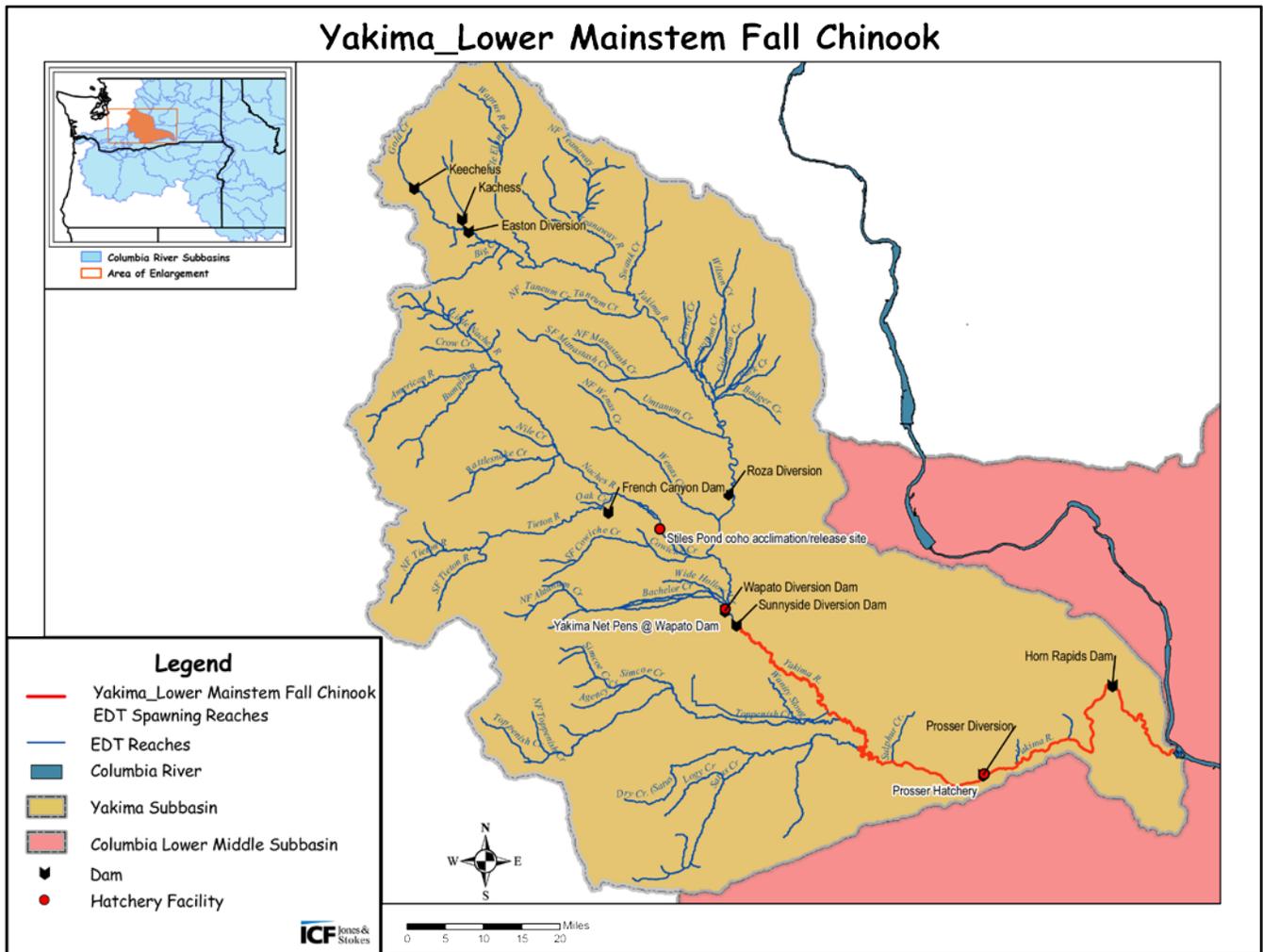
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Klickitat Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|--------------------------------------|-----------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 77% | 0.00 | 910 | 0.7 | 2,507 | 0 |
| | URB Hatchery Seg Harv | 3,867.2 | 0% | | | | | | 17,453 | 1 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 491 | 1.5 | 1,351 | - |
| HSRG Solution | None None | - | 0% | 0% | 55% | 0.00 | 629 | 0.7 | 1,731 | 0 |
| | URB Hatchery Seg Harv | 3,436.0 | 80% | | | | | | 18,341 | 3,329 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 53% | 0.00 | 703 | 0.8 | 1,937 | 0 |
| | URB Hatchery Seg Harv | 3,436.0 | 80% | | | | | | 18,341 | 3,329 |

Hatchery Scientific Review Group Review and Recommendations

Lower Yakima Mainstem Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Lower Yakima Mainstem Fall Chinook

It is unclear whether a distinct stock of fall Chinook historically existed in the Yakima subbasin or whether fall Chinook in the Yakima have always been a satellite population of Hanford Reach Upriver Brights (URBs). Certainly, the mainstem population is now such a satellite. Based on an electrophoretic analysis of allozyme samples collected from spawning fish in Marion Drain, the mainstem near Benton City, and the mainstem above Prosser Dam, Busack et al (1991) concluded that the Yakima mainstem stock was genetically distinct from the Marion Drain stock, and that the mainstem stock is indistinguishable from Hanford Reach URBs. The scant literature on the subject suggests that historical abundance of fall Chinook probably ranged from about 38,000 (Kreeger and McNeil 1993) to 100,000 fish (1990 Yakima Subbasin Plan). The Kreeger and McNeil figure is based on the assumption that the proportion of the historical fall Chinook run in the Yakima should be the equal to the proportion of the area of the historical Columbia Basin watershed represented by the Yakima subbasin (3.8%). The Yakima Subbasin Plan based its estimate on the amount of suitable spawning habitat for Chinook historically present in the Yakima subbasin and the area occupied by a typical Chinook redd.

The mean adult fall Chinook spawning escapement in the mainstem Yakima River from 1998 to 2006 can be roughly estimated as 5,700 fish, with a range of 1,940 to 13,846. The estimate is crude because turbidity makes redd counts in the lower Yakima unreliable, and because prior to 2003, approximately half of all fall Chinook redds were deposited below the Prosser Dam counting station¹. The 5,700 fish number represents an expansion of annual Prosser Dam counts expanded by the annual estimate of below-Prosser spawning, plus harvest below Prosser.

Fall Chinook spawn in the Yakima mainstem from Sunnyside Dam (RM 103) downstream almost to the Columbia confluence. Redds are distributed patchily throughout the river. Prior to 2001, the largest and most heavily utilized area was between Horn Rapids Dam (RM 18) and the Benton City Bridge (RM 30). Since then, spawning activity has shifted upstream and is now concentrated between the Chandler Power Plant outfall (RM 35.8) and Prosser Dam (RM 47). From 2001 to 2004, an average of 50% of the return was estimated to spawn above the power plant outfall; in 2005 and 2006, 80% of the spawning escapement occurred above the outfall (Hoffarth-WDFW, personal communication, 2006). Spawning location can vary depending on the amount of submerged aquatic vegetation growth in historic spawning beds in the lower Yakima. When water conditions are favourable for growth of aquatic vegetation in the lowermost reaches of the river, the salmon spawn in areas further upstream. Spawn timing is relatively concentrated above Prosser Dam, beginning about the middle of October, peaking the first week of November, and ending by the third week of November. Spawning in the lower mainstem, however, apparently includes some fish that spawn much later than the norm. WDFW biologists operated a screw trap in the lower river in 1990 and captured 35-mm newly-emergent fry in May, when most fall Chinook were 80- to 100-mm smolts (Busack et al. 1991). A spawning timing of late December or early January would be consistent with a May emergence. On the basis of mean water temperatures and 1,600 temperature units for emergence of fall Chinook (Piper 1987), emergence does not occur in the mainstem before late March and extends into the third week of April. Curt Knudsen (WDFW, personal communication, 1992) estimated

¹ Since 1998, the proportion of the mainstem fall Chinook spawning escapement occurring below Prosser Dam has ranged from 20 to 70% (P. Hoffarth, WDFW, personal communication, 2007). In the 1980s and early 1990s, the proportion was estimated to be ~70%. Several irrigation districts discharging waste water in the lower Yakima River substantially reduced the suspended sediments in their discharges in the mid-1990s. The clarity of the lower Yakima subsequently increased substantially, and an explosive growth of aquatic vegetation occurred inside major fall Chinook spawning reaches. The upriver shift of fall Chinook spawning from the 1980s to the present time may be attributable to vegetation-clogged spawning areas in the lower river.

that the mean proportion of fish that were ocean age 1 through 4 in the mainstem stock was, respectively, 12%, 12%, 66% and 11%, and that the sex ratio for the mainstem stock was 46% males and 54% females. By contrast, the age distribution for Marion Drain fish for the same ages was 48%, 46%, 6% and 0%, and the sex ratio was 73 to 86% males and 14 to 27% females.

Prior to 1999, in-basin harvest of fall Chinook was virtually nonexistent. Since 1999, terminal harvests have ranged from 34 to 2,300 fish, with a mean of 1,025 (HGMP). The Yakama Nation has estimated terminal harvest averages around 12%.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Lower Yakima mainstem fall Chinook are part of the Upper Columbia Summer/Fall Chinook run, which NOAA has determined does not warrant listing under the ESA at this time.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette results in a designation of Contributing.
- **Current Viability Rating:** Unknown; SaSSI rates as Healthy.
- **Recovery Goal for Abundance:** NA, because not listed.
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (from EDT):** Productivity: 3.29; Capacity: 14,989

2.2 Current Hatchery Programs Affecting this Population

Two hatchery programs currently target the lower Yakima mainstem: a segregated program releasing approximately 1.7 million Little White Salmon (LWS) sub-yearling smolts per year, and an integrated program releasing an average of 320,000 Yakima River stock sub-yearlings per year. Both releases are made at Prosser Hatchery (RM 46.8). The LWS program is the result of the *US v. Oregon Columbia River Fish Management Plan*, which established a short-term production goal for the Yakima subbasin requiring the annual release of 1.7 million Little White Salmon URBS. The long-term production goal for the Yakima subbasin is predicated on construction of a hatchery with a capacity of 3.0 million URBS. The LWS program is part of mitigation for the lost natural production of tens of thousands of adult spawners due to flooding of mainstem habitat from construction of John Day Dam, and is partially funded by the Mitchell Act. The Yakima River stock program is an element of the Yakima/Klickitat Fisheries Project and is funded by BPA.

Little White Salmon Program. From the inception of the LWS program until 1993, two approximately equal releases were made annually, one in the vicinity of Sunnyside Dam at RM 103, and one below Prosser Dam at RM 47. When the Prosser Hatchery, located just below Prosser Dam, was completed in 1994, all LWS releases were shifted there, partly because of the very low survival rates of smolts in the reach from Sunnyside Dam to Prosser Dam.

Fry are trucked from the Little White Salmon Hatchery to large acclimation ponds at Prosser Hatchery in early March. These fish rear in the acclimation ponds until early to mid-April when a volitional release to the river occurs. The size of fish at release varies from 55 to 74 fish per pound. The release time is variable, because water temperatures in the lower Yakima can become

lethal in the late spring. Releases as early as late April have occurred during the hottest years and as late as the end of May in cooler years.

In BY2006, an experimental element was added to the LWS program. Specifically, the effect of accelerated vs. conventional release timing was assessed for the LWS stock. This experiment entailed the transfer of 500,000 eyed-eggs in the late fall from LWS to Prosser Hatchery for incubation and rearing. The resulting sub-yearlings were released in 2007, along with the accelerated Yakima-stock fish. Smolt survival for the LWS and Yakima-stock accelerated releases was 34% and 41%, respectively (Neeley 2007). Paired LWS/Yakima-stock releases were made again in BY2007: another 500,000 LWS eyed eggs were to be imported, and the resulting juveniles to be released along with the accelerated Yakima-stock fish and the LWS fish brought in as fry in March. A total of 10,000 fish from each LWS group (accelerated/conventional) will be PIT-tagged to allow comparison of relative smolt-to-adult survival rates between groups. Currently, only 10% of the 1.7 million LWS fish are coded-wired-tagged and adipose-clipped, limiting the ability to estimate survival. The implementation of PIT-tagging for accelerated and conventional LWS releases will allow SARs between accelerated and conventionally released LWS fish to be compared.

Yakima Program. The “Yakima Program” refers to a separate fall Chinook hatchery program that collects broodstock inside the Yakima River. The intent of this program is to develop a locally-adapted broodstock and, over time, to increase production until the importation of LWS fish can be discontinued.

The Yakima Program collects broodstock from the channel between the headworks of Chandler Canal (at Prosser Dam) and the rotary drum smolt bypass screens about 1 mile below. Adult fall Chinook that pass the ladders above Prosser Dam and, for whatever reason, go back downstream, quite frequently enter Chandler Canal, where flows are low, the spill over the dam crest is minimal, and the thalweg leads directly into the headworks of the canal. Since the program began in 1997, from 100 to 500 adults have been taken as broodstock. Fish in excess of broodstock needs are removed from the canal and released in the river. Because hatchery fall Chinook released into the Yakima River have never been 100% marked, the proportion of naturally-spawned fish in the broodstock cannot be estimated with any precision. Yakama Nation biologists estimate it is probably on the order of 10%. The proportion of Marion Drain fish in the broodstock has not been determined, but is thought to be very small (HGMP).

From its inception, the Yakima Program has been experimental. The original experimental goal was to develop a procedure by which healthy, actively migrating fall Chinook smolts can be produced by mid- to late-April. If successful, passage through the lowermost portions of the river could occur before temperatures become too high. Accordingly, for BYs 1998-2004, approximately half of the Yakima-stock juveniles were assigned to an accelerated group and half to a conventional rearing group. During this time, 100% of these fish were differentially marked with left or right pelvic clips. None of the Yakima stock smolts are coded-wire tagged or adipose-clipped, but between 2,000 and 4,000 are PIT-tagged to facilitate survival estimates. Ponding occurred in the third week of January for the accelerated group and in the second week of February for the conventional group. The accelerated group was usually released around April 20 and the conventional group around May 20. Both groups were allowed a two-week volitional release period, after which all fish were forced into the river. The survival of smolts from release to McNary Dam for release years 1999 to 2005 was greater for the accelerated group than for the conventional group in all years except 2000. Since 2005, the majority of Yakima-stock have been reared using an accelerated treatment.

Beginning with BY2006, the Yakama Nation began another experimental rearing treatment using an in-basin stock to compare an accelerated sub-yearling release vs. a yearling release. A total of

9,000 sub-yearlings (BY2006) were held initially to see if they could be reared to yearlings. About 93% of the retained sub-yearlings survived, and all were released mid-April of 2008 with an equal number of sub-yearlings. Both groups were 100% adipose-clipped and PIT-tagged for monitoring. This experiment will continue with approximately 10,000-fish groups of marked sub-yearlings and marked yearlings being released (simultaneously) in April for a minimum of 3 years. The yearling releases may yield a higher smolt survival and ultimately higher adult returns, accelerating the development of a locally adapted brood stock source.

The total number of Yakima-stock smolts released from 1999 to 2005 has ranged from 192,000 to 561,000, with a mean of 372,000.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 285 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 413 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.3. Average abundance of natural-origin spawners (NOS) would increase from 758 to 1,247. Harvest contribution of the natural and hatchery populations would go from 5,712 to 2,115.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This program is sustained by annually importing fall Chinook from outside the basin, a practice that is inconsistent with sustaining natural production. With current facilities, it is not possible to collect sufficient broodstock to sustain a hatchery program.

Current collection facilities are located upstream of historic spawning reaches, making it difficult to collect natural broodstock for an integrated program.

Due to low natural productivity, high pHOS levels and current pre-terminal harvest rates, this population cannot meet the standards of a Contributing population if the hatchery program is managed as a segregated harvest program. If adequate adult collection were possible, the population could sustain an integrated program of 500,000 and be consistent with the standards of a Primary population. Alternatively, the population could sustain an integrated program of 1,000,000 and be consistent with the standards of a Contributing population. If hatchery fish are harvested at a higher rate than wild fish, it may be possible to support larger programs.

Approximately 10% of the hatchery fish are marked. This prevents an accurate determination of the composition of natural-origin fish in the broodstock and on the spawning ground.

Due to changes in habitat conditions in the lower river, spawning habitat has been reduced.

Recommendations

Regardless of the population designation, developing the capability to collect local broodstock should be the first priority. This would increase survival and the likelihood of meeting harvest and conservation goals.

Mark all juveniles from this program to make it possible to identify and manage the origin of broodstock, monitor the natural-origin population and achieve desired harvest rates for hatchery and natural-origin population components.

Implement the most effective means for capturing broodstock.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with.

However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

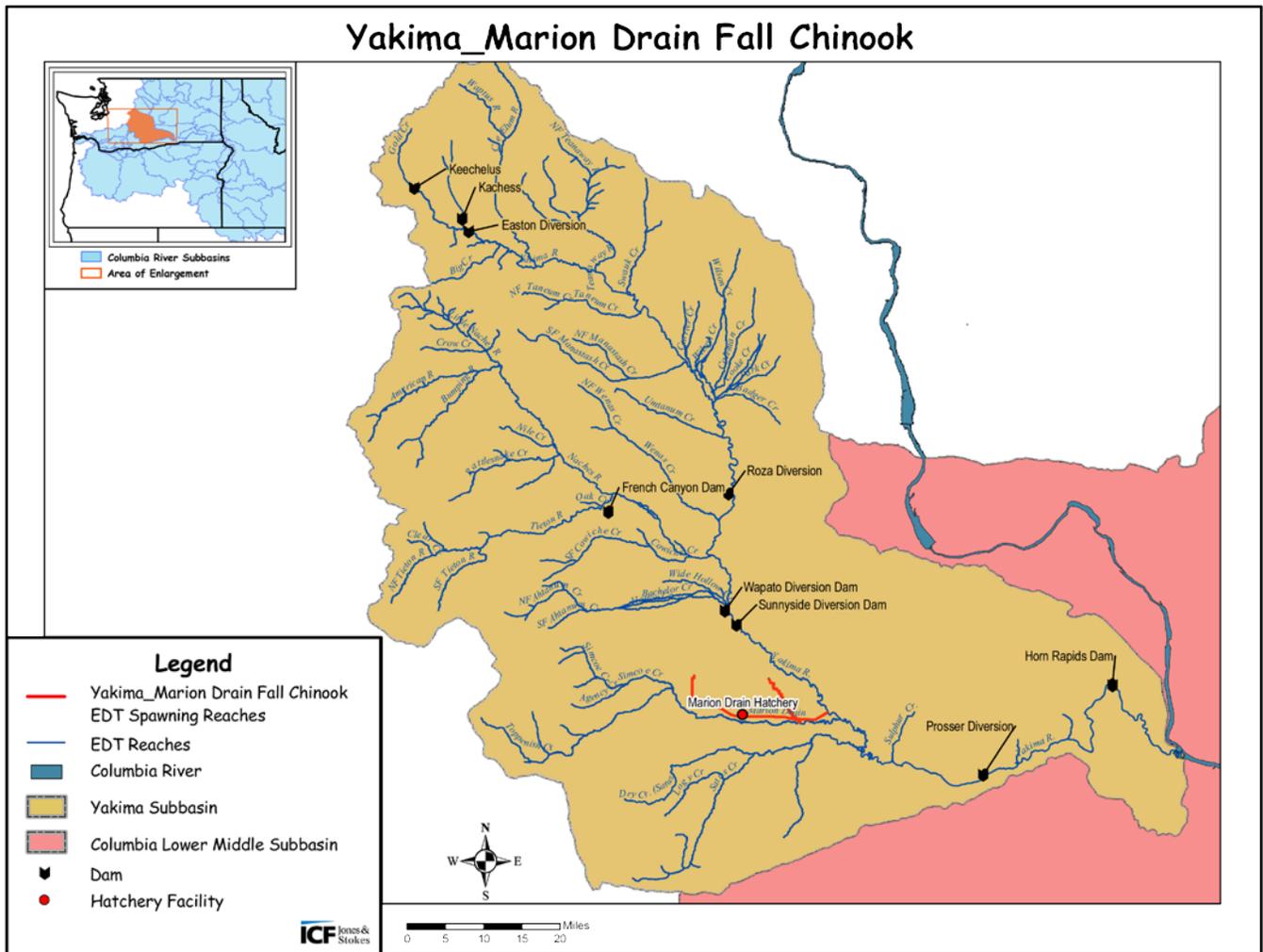
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Lower Yakima Mainstem Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Harv | 346.6 | 45% | 0% | 42% | 0.11 | 758 | 0.6 | 2,219 | 92 |
| | Seg Harv | 1,701.0 | 5% | | | | | | 3,493 | 102 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,247 | 1.3 | 2,155 | - |
| HSRG Solution | Int Harv | 2,010.1 | 50% | 0% | 60% | 0.40 | 1,212 | 0.7 | 7,896 | 984 |
| | Seg Harv | - | 90% | | | | | | - | - |
| HSRG Solution w/ Improved Habitat | Int Harv | 2,010.1 | 50% | 0% | 54% | 0.43 | 1,546 | 0.8 | 8,474 | 984 |
| | Seg Harv | - | 90% | | | | | | - | - |

Hatchery Scientific Review Group Review and Recommendations

Marion Drain Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Marion Drain Fall Chinook

Marion Drain is an 18-mile long irrigation ditch that was built in 1910 and drains the large irrigated area on the Yakama Indian Reservation served by the Wapato Irrigation Project. The ditch is deep enough that it intercepts ancient alluvial gravels and collects large quantities of groundwater that percolate toward it from the irrigated fields to the north. Much of Marion Drain functions like a spawning channel, with large quantities of groundwater upwelling through a cobble/gravel substrate. At some point in the past and by some means (a number of stories exist about intentional or unintentional outplanting in the past), a population of fall Chinook with an URB-like spawn timing (mid-October to mid-November) became established inside Marion Drain. Based on an electrophoretic analysis of allozyme samples collected from spawning fish in Marion Drain and the mainstem near Benton City in 1989 and 1990, Busack et al (1991) concluded that there were two genetically distinct stocks in the basin: the Marion Drain stock and the “mainstem stock.” Subsequent analyses of allozymes from fish collected in the mainstem above Prosser Dam were indistinguishable from the Benton City samples. Therefore, all mainstem spawners appear to belong to the same genetic group, which is indistinguishable from Hanford Reach URBs. The Marion Drain stock, on the other hand, genetically resembles Snake River fall Chinook and Deschutes River (OR) fall Chinook more than URBs, and apparently occurs only in Marion Drain.

Marion Drain redd counts ranged from 12 to 117 (mean of 56) between 1983 and 2004 (HGMP). Because of a very unusual age and sex composition, these numbers translate to spawning escapements ranging from 120 to 1,170, with a mean of 560. In 1992, an adult trap was installed on lower Marion Drain and the entire run was counted, sexed and aged (Seiler 1992). A total of 412 fish entered the Drain, 14% of which were adult females, 42% of which were adult males and 44% of which were jacks. The age composition of the adults was also unusual. In Marion Drain, the proportion of adults that were ocean age 1, 2, 3 and 4 was 48%, 46%, 6% and 0%, respectively. By contrast, the age composition of adult fall Chinook sampled in the Yakima mainstem the same year was 12%, 12%, 66% and 11% for ocean ages 1 through 4. The Marion Drain population is clearly much younger than the mainstem population. One theory for this difference is that the large quantity of groundwater in the drain, plus the abundance of amphipods and other prey, physiologically trigger early maturation and jacking. Water temperatures in the drain clearly are warmer in the winter and cooler in the summer than the Yakima mainstem, and fall Chinook fry do emerge in mid-February in the drain and mid-April in the mainstem (Talbot 1992).

Prior to 1999, in-basin harvest of fall Chinook was virtually nonexistent. Since 1999, terminal harvests have ranged from 34 to 2,300 with a mean of 1,025 (HGMP). The Yakama Nation has estimated terminal harvest, almost entirely from sport fishing, averages around 12%.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Undetermined. Mainstem Yakima fall Chinook are part of the Upper Columbia Summer/Fall run Chinook ESU, for which listing is not warranted. The National Marine Fisheries Service ESU Status and Description web page (<http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Chinook/CKUCF.cfm>) specifically excludes Marion Drain fall Chinook from the Upper Columbia Summer/Fall Chinook ESU. The Marion Drain

population is, however, assigned to the mid-Columbia and Snake fall Chinook Genetic Diversity Unit (GDU 6)

- Population Designation: Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette results in a designation of Contributing.
- Current Viability Rating: Unknown; SaSSI rates as Healthy.
- Recovery Goal for Abundance: NA, because not listed.
- Productivity Improvement Expectation: Unknown, but likely very small.
- Habitat Productivity and Capacity (from EDT): Productivity: 2.08; Capacity: 448.

2.2 Current Hatchery Programs Affecting this Population

From 1983 to 1999, only Little White Salmon (LWS) Hatchery URBs were released in the Yakima River. From 1983 to 1993, two releases were generally made, one at various sites near Sunnyside Dam (RM 104), the approximate upstream end of the historic fall Chinook spawning area; and one below Prosser Dam (RM 47). Survival of the upriver releases to the smolt trap at Prosser Dam was very poor. Consequently, after 1993, all LWS releases were made from a number of large acclimation ponds at the newly constructed Prosser Hatchery, located just downstream of Prosser Dam. That practice continues to the present time.

Artificial propagation programs using naturally-spawned Yakima fish as broodstock began in 1997, both at Marion Drain and at the Prosser Hatchery. The Marion Drain program is an integrated program that uses a fish wheel to collect broodstock approximately 6.7 miles inside Marion Drain. Any un-clipped fish collected are assumed to be of Marion Drain stock (neither the Marion Drain nor the Prosser programs adipose-clip their fish). There is, however, some evidence that this assumption may be incorrect. Todd Kassler, a WDFW geneticist, wrote a memo to Yakima/Klickitat Fisheries Project staff in August of 2007 describing the results of a genetic analysis of Marion Drain broodstock collected in 2005. In it he says, "The individual assignments of the 2005 Marion Drain samples were to the lower Yakima River instead of Marion Drain." Mr. Kassler speculated that this might mean mainstem fish in some numbers in fact do stray 6.7 miles inside Marion Drain to the fish wheel, and/or that the Marion Drain and mainstem populations had already introgressed to the point where they are indistinguishable. The issue has not yet been resolved. Thus, the percent natural-origin broodstock for this program is unclear at two levels: the proportion of brood fish that were not spawned in Marion Drain Hatchery, and the proportion of brood fish that are genetically descended from the unique Marion Drain population first described in the late 1980s.

The number of broodstock collected between 1998 and 2002 ranged from 8 (2 females and 6 males) to 32 (7 females and 25 males). Over this period, from 4,000 to 52,000 (mean 23,870) sub-yearling smolts at approximately 65 fish per pound were released. Releases begin early to mid-April and are volitional for two weeks, after which fish are forced from the raceway and into Marion Drain. Marion Drain fish are not adipose-clipped, but are coded-wire tagged, and 1,000 to 4,000 are PIT-tagged to facilitate survival estimates.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 42 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 445 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.1. Average abundance of natural-origin spawners (NOS) would decrease from 112 to 23. Harvest contribution of the natural and hatchery populations would go from 189 to 21.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is a gene banking conservation program intended to protect what is presumed to be a small and unique population. The fish currently are coded-wire tagged, but not adipose-clipped, and 1,000 to 4,000 are PIT-tagged.

Recommendations

Develop a conservation and recovery plan for this population. In the near term, collect as many natural-origin fish for broodstock as possible. Additional methods to collect broodstock should be developed. Monitor natural escapement and make every effort to restrict it to fish from the Marion Drain population.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

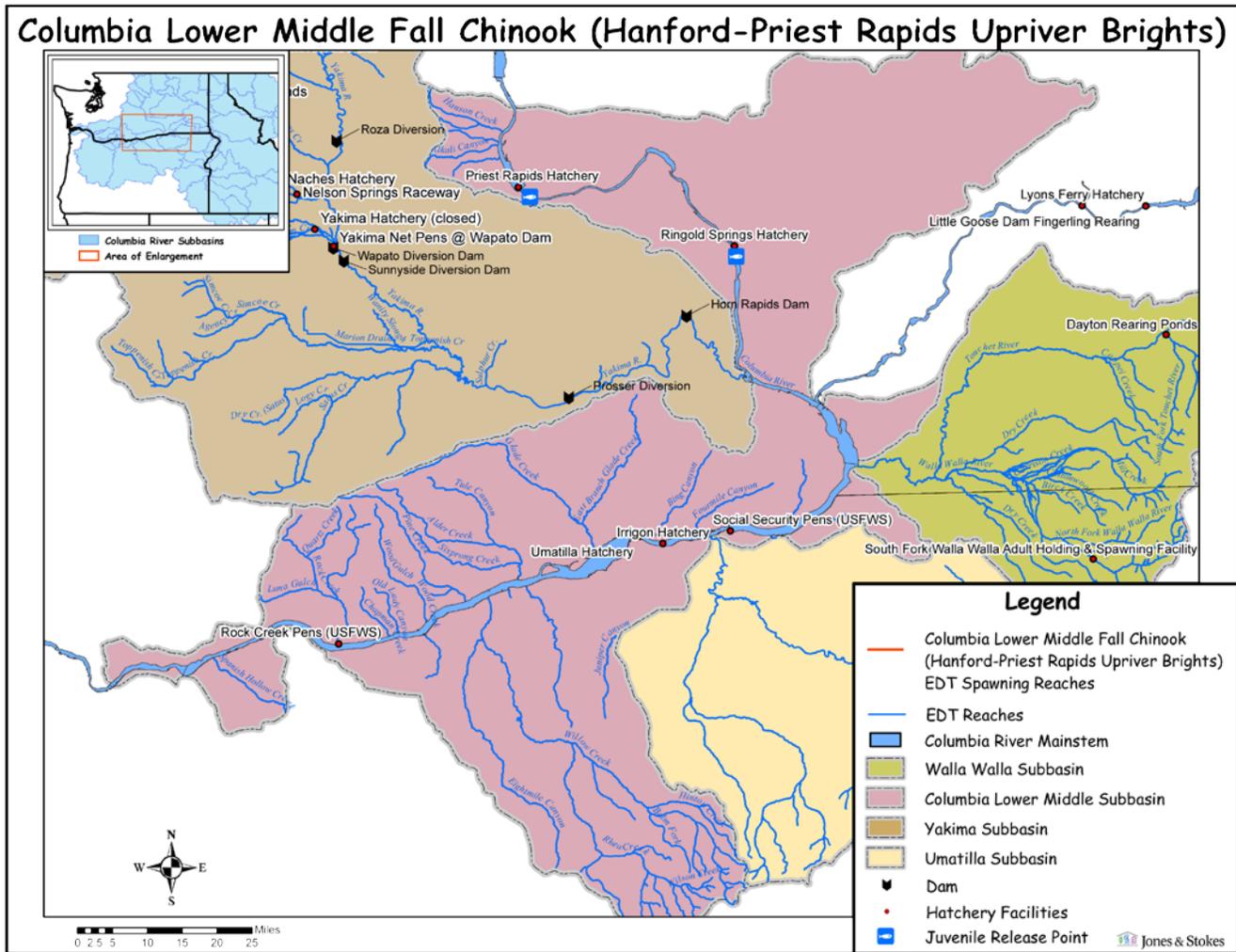
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Marion Drain Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 20.5 | 50% | 0% | 78% | 0.24 | 112 | 0.6 | 189 | 30 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 23 | 1.1 | 21 | - |
| HSRG Solution | Int Cons | 20.5 | 10% | 0% | 84% | 0.49 | 153 | 0.7 | 237 | 6 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 20.5 | 10% | 0% | 82% | 0.49 | 172 | 0.8 | 254 | 6 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Hanford Reach Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Columbia Middle Mainstem (Hanford Reach and Priest Rapids) Fall Chinook

The Columbia River Upriver Bright (URB) stock is defined as wild and hatchery fall Chinook originating upstream of McNary Dam (All-Species Review 1996). The URBs are major contributors to ocean fisheries, and are an escapement indicator stock/ model stock to the Chinook Technical Committee (CTC) of the Pacific Salmon Commission. Hanford Reach URBs are one of few Columbia River salmon stocks that currently are not in decline; they are classified as strong by Nehlsen et al. (1991) and healthy by Huntington et al. (1996) and WDFW (1993).

An average of 38,000 Hanford fall Chinook adults spawned naturally from 1994 to 2001. Evenson et al. (2002) estimated that Priest Rapids Hatchery adults comprised an average of 8.6% of this escapement (range of 1.3% to 33.1% for a 20-year period), resulting in a natural-origin spawning escapement of approximately 34,000 adults for approximately the same period. This estimate did not attempt to account for hatchery fish released from the Yakima, Ringold or Umatilla programs and spawning naturally in the Hanford Reach.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Hanford Reach Chinook are part of the Upper Columbia River Fall-run ESU Chinook Salmon; this ESU is not listed.
- Population Designation: Primary - using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette.
- Current Viability Rating: Unknown.
- Recovery Goal for Abundance: NA.
- Productivity Improvement Expectation: None
- Habitat Productivity and Capacity (from EDT): Productivity: 9.0; Capacity: 150,000 (based on professional judgment – no EDT estimates were available).

2.2 Current Hatchery Programs Affecting this Population

Two fall Chinook hatchery programs are operating in the Hanford Reach of the Columbia River. The Priest Rapids program is an integrated release of 6.7 million. Another 3.5 million are released from the Ringold Hatchery using juveniles from Bonneville Hatchery.

Priest Rapids Hatchery Fall Chinook- The Priest Rapids Hatchery (WDFW and Grant County PUD) was built in 1963 to mitigate for the Priest Rapids and Wanapum dams. The hatchery program is integrated with the last remaining mainstem natural population (Hanford Reach fall Chinook). The number of natural-origin fall Chinook trapped and used in the broodstock each year is unknown (personal communication, J. Sneva and B. Foster, WDFW; 2005 HGMP), but is thought to be low due to the location of the trap high in the outlet channel, and the use of well water to supply the channel to attract hatchery-produced adult fish.

The purpose of the Priest Rapids Hatchery program is to mitigate for the loss of fall-run Chinook salmon adults that would have been produced in the region in the absence of the Priest Rapids

Project. Additional fall Chinook sub-yearlings are also produced as partial mitigation for John Day Dam, which is funded from sources other than the Mid-Columbia Mitigation and Compensation Plan.

The production release goal is 5.0 million for Priest Rapids and another 1.7 million for the John Day mitigation. Average release from Priest Rapids has been 6.6 million sub-yearling Chinook at approximately 50 fish per pound. Fish are released on-station from early to late June. Annually, 3% of the 5.0 million release is adipose fin-clipped and coded-wire tagged (200,000 fish). The 1.7 million released for the John Day mitigation is 100% adipose fin-clipped.

Survival has averaged 0.4% for brood years 1990 to 1998, with a range of 0.03 to 0.89%.

Broodstock is collected at the Priest Rapids Trap. Annually, approximately 3,100 females are collected. Average fecundity has been 4,404 eggs. The 2005 HGMP reported mating protocols of 1:1 male to female ratio when less than 1 million eggs are collected in a day. On days when more than 1 million eggs are collected, the mating will not be less than 1:3 males to females. The actual ratio of males to females has averaged 1 male to 2 females for 2000 to 2004. Jacks make up 3% of the males.

The percent of Priest Rapids hatchery-origin Chinook in the total Hanford Reach escapement averaged 8.6% from 1979 to 2001 (Evenson et al. 2003). This estimate does not include strays from other nearby hatchery programs (Yakima, Ringold, and Umatilla).

Ringold Hatchery Fall Chinook - The Ringold fall Chinook program is segregated harvest program based on Bonneville Hatchery URBs. The program objective is to replace losses of wild URB Chinook that contribute to treaty Indian and non-Indian sport and commercial fisheries resulting from the federal Columbia River hydropower system and habitat degradation in the Columbia River Basin.

Initially built as part of the Columbia River Fisheries Development Program, Ringold Springs was originally used in conjunction with Lyons Ferry Fish Hatchery as part of the Lower Snake River Compensation Plan (LSRCP) to rear 1.1 million spring Chinook salmon. Funding was provided by NOAA Fisheries via the annual Mitchell Act budget for Columbia River hatchery fish production. In 1997, a cooperative agreement between the Army Corps of Engineers, the Washington State Department of Fish and Wildlife, NOAA Fisheries and the Bureau of Reclamation was reached to share the facilities at Ringold Springs Hatchery for the benefit of the URB fall Chinook salmon (John Day mitigation) at Bonneville Hatchery. The first year of release of URB fall Chinook from Ringold Springs for this revised program was in 1997.

No adult spawning or incubation is currently possible at this facility due to high water temperatures; therefore, operations depend upon other hatcheries for egg take and early rearing. Broodstock for this program are collected at ODFW's Bonneville Hatchery. Initially the preferred broodstock source was Hanford Reach adults; however, this was switched to Bonneville Hatchery. The HGMP provides no reason for the switch. The URB stock was selected because it has characteristics (primarily late maturation) that are more desirable for Columbia River fisheries than Lower Columbia River tule stocks.

Fish are transferred from Bonneville Hatchery and acclimated for 30 to 45 days prior to release from Ringold Springs. From 1998 to 2004, actual releases have averaged 3.1 million sub-yearling fish at 40 to 60 fish per pound. Currently, all fish released from Ringold are adipose fin-clipped.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 4,518 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 2,627 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.1 to 4.0. Average abundance of natural-origin spawners (NOS) would increase from 32,401 to 55,950. Harvest contribution of the natural and hatchery populations would go from 71,582 to 75,586.

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is the most abundant population in the Columbia River Basin and supports important state and tribal fisheries. The purpose of the hatchery programs in the Hanford Reach (Priest Rapids and Ringold Springs) is to provide harvest. Currently fish are not externally marked.

Adult collection potential at Ringold is limited by shallow depth of flow across the alluvial fan at the mouth of Spring Creek, which inhibits adult fall Chinook migration into the Ringold trap. The history of avian predation and disease also inhibits salmon production. Continued use of the Ringold facilities would require extensive renovations.

Well water supply at the Priest Rapids facility is limited for fish rearing, although not for fish incubation.

Because of the inability to manage the contribution of hatchery fish to spawning consistent with guidelines for a Primary population, segregated hatchery programs of sufficient size to meet program goals are not feasible.

Given the estimates of natural adult contribution to the hatchery broodstock and the contribution of hatchery fish to natural spawning, the existing programs do not meet the PNI standards for a Primary population. Under current harvest and habitat conditions, an integrated program of approximately 10 million could be operated and meet the standards of a Primary population, if 50% of the returning hatchery fish are recaptured at the hatchery and if 50% of the broodstock can be collected from natural-origin adults (resulting in a PNI greater than 0.67). The ability to expand this program significantly and achieve the standards of a primary population would require greater differential harvest and/or increased access to natural spawners for broodstock.

Because of the productivity and abundance of the natural population, there is significant flexibility in sizing an integrated hatchery program.

Recommendations

Move all fall Chinook hatchery production from Ringold to Priest Rapids Hatchery, where the capability to collect a higher proportion of returning hatchery adults exists and where significant increases in production may be possible.

Terminate importation of all fish from outside of the Hanford Reach (such as the Bonneville Hatchery URBs). Adipose-clip all hatchery fish released to allow for broodstock management at Priest Rapids and assessment of hatchery fish spawning naturally. Coded-wire tag a portion of the release to evaluate straying and harvest contributions.

Because the abundance and the productivity of this population are so important to the viability of this ESU and the harvest goals in the basin, this population should be managed to meet the highest conservation standards. Composition on the spawning ground and the hatchery broodstock should be managed consistent with conservation goals for this population. The PNI should be greater than 0.67 and pHOS as low as possible.

Any future expansion of the fall Chinook program should focus on the Priest Rapids facility rather than the Ringold facility.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

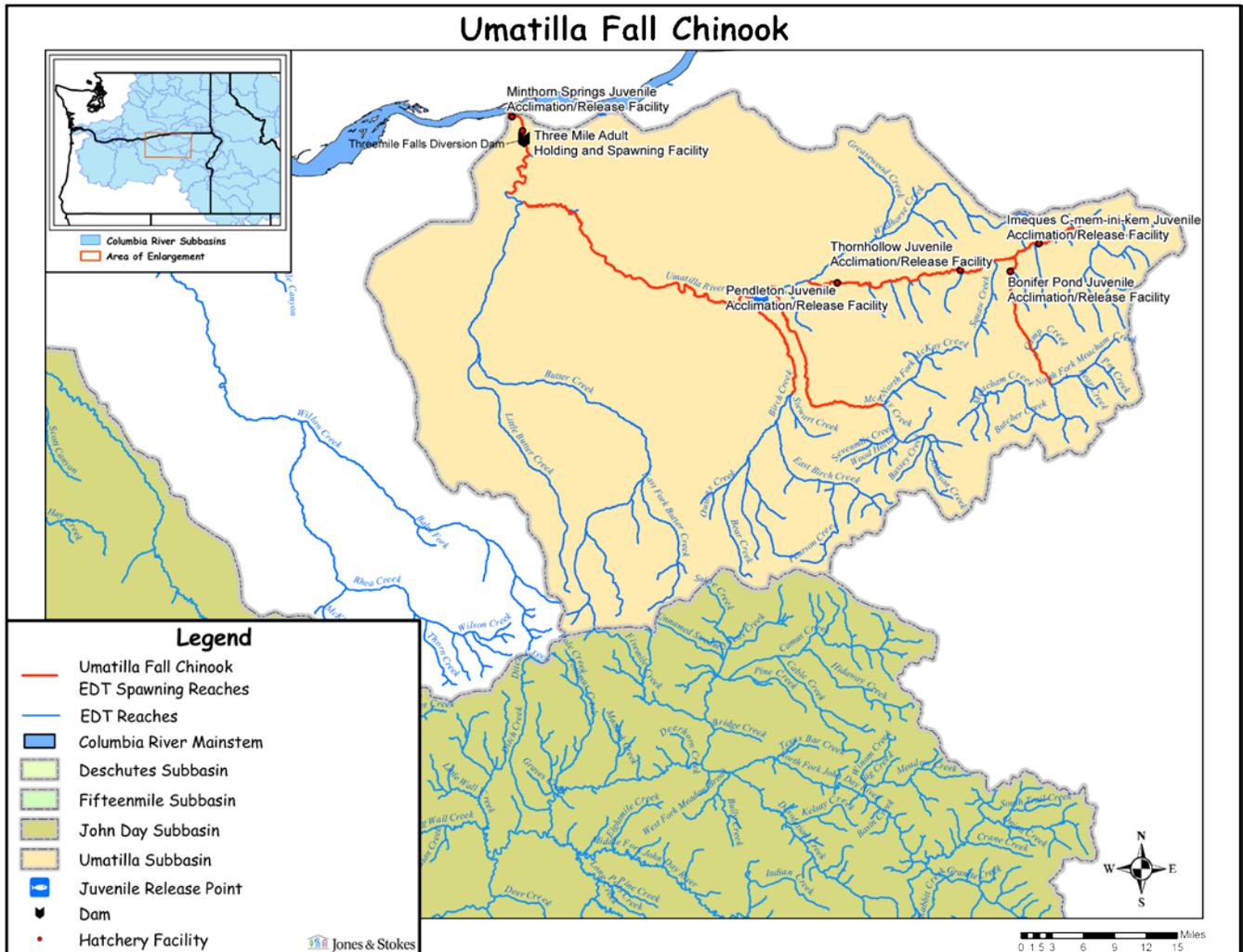
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Hanford Reach Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Harv | 6,691.2 | 75% | 0% | 15% | 0.12 | 32,401 | 2.1 | 65,724 | 10,219 |
| | URB-Ringold-HatcherySeg Harv | 3,499.5 | 23% | | | | | | 5,858 | 859 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 55,950 | 4.0 | 75,586 | - |
| HSRG Solution | Int Harv | 10,218.5 | 50% | 0% | 18% | 0.73 | 49,933 | 3.5 | 104,352 | 11,201 |
| | URB-Ringold-HatcherySeg Harv | - | 70% | | | | | | - | - |
| HSRG Solution w/ Improved Habitat | Int Harv | 10,218.5 | 50% | 0% | 16% | 0.75 | 57,500 | 3.9 | 114,576 | 11,201 |
| | URB-Ringold-HatcherySeg Harv | - | 70% | | | | | | - | - |

Hatchery Scientific Review Group Review and Recommendations

Umatilla Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Umatilla Fall Chinook

The Umatilla/Willow subbasin is a 3,714-square-mile area in northeastern Oregon situated primarily in Umatilla and Morrow counties, with a small portion extending into Union County. The Umatilla/Willow subbasin is composed of four drainages: the Umatilla subbasin, the Willow Creek subbasin, the Six-Mile Canyon drainage, and the Juniper Canyon drainage. The mainstem Umatilla River is 89 miles long and the river and its tributaries drain an area of nearly 2,290 square miles. Willow Creek is 79 miles long and drains an area of about 880 square miles. The Six-Mile Canyon area, which contains intermittent streams that rarely drain into the Columbia River, is 472 square miles. The mainstem of Juniper Canyon Creek is 19 miles long and drains 72 square miles (Umatilla Subbasin Plan 2004).

Habitat degradation due to agricultural water withdrawal, construction of Three Mile Dam, and forest management practices led to the extirpation of salmon from the Umatilla subbasin in the early 1900s (Umatilla Subbasin Plan 2004).

Fall Chinook were reintroduced into the Umatilla River in 1982 with Spring Creek tule stock (in 1982) and upriver bright stock (1983 on). However, the first adults did not return to the river until 1988. Between 1988 and 2001, the average number of adults returning was 493; jacks also make up an important part of the return and their numbers have averaged 275 during the same period. A strong increase in the number of adults returning to the Umatilla River was evident from 1998 to 2001. In 1995, the first naturally produced adult Fall Chinook returned to the Umatilla River. The numbers of naturally produced adults has been very small and hatchery returns represent the great portion of total returns. Productivity of fall Chinook in the subbasin is very low, based both on female spawning escapement and the number of returning adults per spawner. To supplement natural production, annual outplanting of several hundred adult females from Priest Rapids and Ringold Springs Hatcheries started in 1996. The historic distribution of fall Chinook in the subbasin is unclear, because traditionally fall and spring Chinook were recognized as one species and it is unknown where divisions between their spawning habitats occurred. Because of the low number of returning adults, there is no tribal or sport harvest of adults; however, there is a small harvest of returning jacks (Umatilla Subbasin Plan 2004).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Naturally spawning fall Chinook in the Umatilla system are the result of hatchery plants and are not included in any ESU nor listed under the ESA.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the lower Columbia and Willamette results in a designation of Contributing.
- **Current Viability Rating:** Unknown
- **Abundance Goals from Umatilla Hatchery Master Plan (1989):** 11,000 wild adults
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (from EDT):** Productivity: 2.0; Capacity: 6,000

2.2 Current Hatchery Programs Affecting this Population

An integrated hatchery program operates in the Umatilla, producing fall Chinook for harvest supplementation and to aid reintroduction of the species to the subbasin. This program collected broodstock at Bonneville and Ringold Springs in the past, but the last release derived from out-of-basin broodstock collections is scheduled to occur in early 2008. All future releases will be derived from adults returning to the Three Mile Falls Dam broodstock collection facility (ISRP 2005).

Current goals require the collection of 760 returning adults at Three Mile Falls Dam to produce 720,000 eyed eggs for rearing at Bonneville Hatchery and 670,000 eyed eggs for rearing at Umatilla Hatchery. Low survival rates associated with rearing to a yearling smolt stage (66.5% egg-to-smolt survival) at Bonneville result in a release from Bonneville into the Umatilla of 480,000 yearling smolts. Higher survival rates at the Umatilla Hatchery (89.6% egg-to-smolt survival), due in part to a shorter rearing time, result in releases of 600,000 sub-yearling fingerlings into the Umatilla.

Adult collection and spawning take place at Three Mile Falls Dam, where adults are collected at random and mated 1:1. Eggs are incubated to the eyed stage at Umatilla Hatchery, when a portion (see above) is transferred to Bonneville for rearing. The remainder complete their rearing at the Umatilla Hatchery.

Juveniles reared at Umatilla are split into two release groups in early May. Half of the release (approximately 300,000) is trucked to the Thornhollow acclimation site at RM 73 for a 3-week acclimation period, followed by volitional release as sub-yearling fingerlings into the Umatilla in late May. The other half of the release remains at the Umatilla Hatchery until they're direct-released in late May from the Reith release site at RM 48 as sub-yearling fingerlings.

Juveniles reared at the Bonneville Hatchery are also divided into two separate releases, but these juveniles are reared to a yearling smolt stage. Half of the Bonneville release (240,000) is trucked to Thornhollow in early March for a 3-week acclimation, followed by volitional release into the Umatilla in late March. After the March release, the other half of the Bonneville release (240,000) is trucked to the Thornhollow Acclimation site for 3 weeks and then volitionally released into the Umatilla.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 1,358 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 495 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly

greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals, consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendations box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated adjusted productivity (with harvest and fitness factor effects from AHA) would increase from 0.5 to 0.9. Because of low habitat productivity in the basin, the natural population is not self-sustaining. Therefore, eliminating the hatchery program would, for all practical purposes, eliminate the natural spawning population (estimated at approximately 700 with the hatchery program) as well as any harvest (estimated at approximately 4,650 fish with the hatchery program).

3.2 HSRG Observations/Recommendations

In the Observations and Recommendations box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population, and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporate all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified two goals for this population: one is to establish a natural sustainable population and the other is to provide harvest opportunities. The population does not appear to be sustainable, given current harvest rates and habitat productivity. With the current harvest and productivity, the natural population cannot sustain any meaningful segregated or integrated program.

On one hand, current habitat quality and quantity is limited in this subbasin, as evidenced by the extirpation of the population. This condition limits opportunities for successful establishment of a natural self-sustaining population. On the other hand, because of passage improvements and collection facilities at Three Mile Dam, it is possible to monitor and manage broodstock

spawning composition, which may increase the likelihood of developing a small locally-adapted naturally spawning population that would benefit from on-going and proposed habitat improvements.

As currently operated, this program is making no progress toward establishing a sustainable natural population. The continual high proportion of hatchery spawners from the current segregated hatchery program (with a PNI less than 0.1) allows no opportunity for the population to adapt to the local environment. A PNI greater than 0.5 is necessary for the natural environment to drive adaptation and increase fitness. Without significant habitat improvements, the natural-origin population will remain relatively small. It is unlikely that this stock could meet the abundance guidelines for a Primary population.

Currently, most hatchery fish are identified with coded-wire tags and are not adipose fin-marked.

Recommendations

To meet the management goal of developing a sustainable natural population while maintaining harvest benefits, we recommend that hatchery broodstock be managed in the following ways. Develop a two-stage stepping stone program to support the natural population and to provide harvest. The program would consist of an integrated conservation component producing approximately 480,000 yearling smolts. This component would be produced and maintained by collecting 100% of its broodstock from natural-origin returns. Excess hatchery-origin returns from the conservation component would provide all broodstock to maintain an additional second stage harvest component of approximately 411,000 zero-age smolts. Unharvested hatchery returns from the harvest component would not be used for broodstock. This would require differential marking of juveniles from the two programs. For example, the juveniles from the conservation program would be coded-wire tagged only, while the harvest program fish would be adipose-marked and coded-wire tagged. This solution would also require that 50% of the unharvested adults from the conservation component be removed (50% would be allowed to spawn), and that 80% of the unharvested adults from the harvest component be removed.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

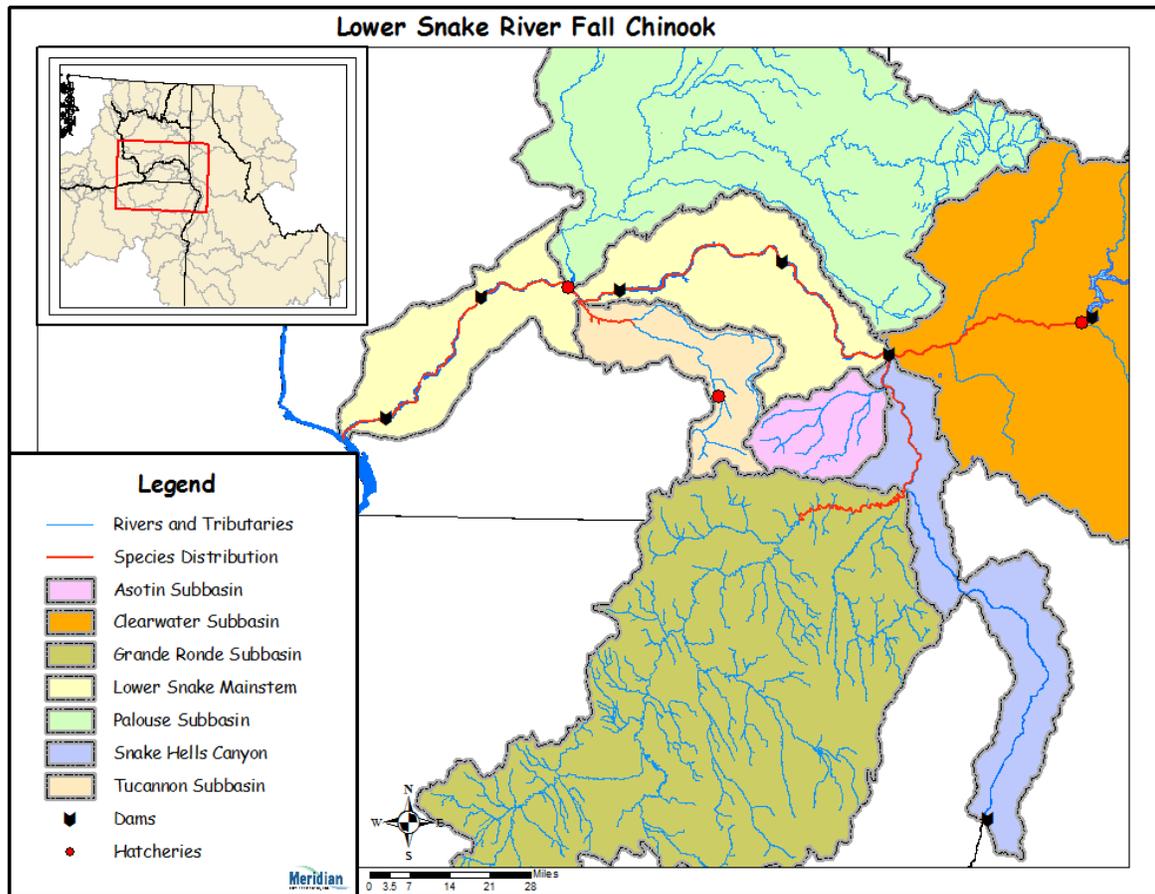
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Umatilla Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 399.2 | 40% | 0% | 68% | 0.13 | 707 | 0.5 | 3,878 | 604 |
| | Seg Harv | 648.0 | 80% | | | | | | 803 | 133 |
| No Hatchery | None None | | | 0% | | 0.00 | 1 | 0.9 | 1 | - |
| HSRG Solution | Int Both | 479.0 | 50% | 0% | 74% | 0.57 | 602 | 0.7 | 4,808 | 1,107 |
| | Stepping Stone Seg Harv | 411.5 | 80% | | | | | | 510 | 317 |
| HSRG Solution w/ Improved Habitat | Int Both | 481.0 | 50% | 0% | 69% | 0.59 | 763 | 0.8 | 5,029 | 1,111 |
| | Stepping Stone Seg Harv | 411.5 | 80% | 0% | 100% | | | | 510 | 317 |

Hatchery Scientific Review Group Review and Recommendations

Lower Snake River Fall Chinook Population and Related Hatchery Programs

January 31, 2009



1 Lower Snake River Fall Chinook

The Lower Snake River Fall Chinook population is part of the Snake River Fall Chinook ESU that is classified as threatened under the Endangered Species Act. This ESU includes fish spawning in the lower mainstem of the Snake River (downstream of Hells Canyon Dam), and the lower reaches of the Clearwater, Imnaha, Grande Ronde, Salmon, and Tucannon rivers. The Lyons Ferry Hatchery stock, originally derived from returns to the lower Snake River, was included in the ESU by the Interior Columbia Technical Recovery Team (ICTRT) (ICTRT 2003). Unlike the other listed Chinook ESUs in the interior Columbia River Basin, Snake River fall Chinook generally exhibit a subyearling, ocean-type life history. Some Snake River fall Chinook exhibit an alternative life history that includes reservoir rearing and migration as yearlings.

2 Current Conditions

Fall Chinook in this population historically spawned in the mainstem Snake River from Hells Canyon Dam to the confluence of the Columbia River and in major tributaries. With construction of the Idaho Power dams in Hells Canyon as well as the federal Columbia River hydropower system, most fall Chinook mainstem spawning habitat has been blocked or inundated by reservoirs. Fall Chinook salmon were extirpated from the Clearwater River subbasin following the construction of Lewiston Dam in 1927. While fish passage facility improvements were made to the dam in subsequent years, historical attempts to propagate fall Chinook in the Clearwater River subbasin were largely unsuccessful. More recently, an integrated hatchery program operating at the Nez Perce Tribal Hatchery has been releasing juvenile fall Chinook into the subbasin with the express purpose of increasing the numbers of fish spawning, incubating and rearing in the natural environment. A majority (70%) of the lower Snake River fall Chinook population spawns in the mainstem Snake River between the top of Lower Granite Reservoir and Hells Canyon Dam, with the remaining among lower sections of the major tributaries. Spawners in the mainstem Snake are apparently distributed in aggregates from the Asotin Creek confluence to River Km 353, although small numbers have been reported to spawn in the tailraces of the Lower Snake River dams.

ICTRT recovery targets for adult abundance and productivity are 3,500 and 1.25 respectively. Of the 3,500 adult spawners, the ICTRT recommends that at least 2,500 of these fish spawn in the mainstem Snake River.

Spawning escapement consist of both natural-origin and hatchery-origin adults. Hatchery adults come from eggs or juvenile fish produced at Lyons Ferry Hatchery and reared and released at multiple locations in the Snake River, or from four artificial propagation programs in the Clearwater River (all based on Lyons Ferry Hatchery stock): the Lyons Ferry Hatchery, Fall Chinook Acclimation Ponds Program, Nez Perce Tribal Hatchery, and Oxbow Hatchery fall-run Chinook hatchery programs.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Snake River Fall Chinook.

- ESA Status: Threatened

- Population Description: For the HSRG review, the population has been classified as Primary.
- Recovery Goal for Abundance: 3,500 wild spawners
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity: Productivity: A range of values was provided to the HSRG based on managers best professional judgment. Productivity: 2.2-3.7; Capacity: 6,000- 8,250. For this analysis, the mid-point of each range was used: Productivity: 2.95; Capacity: 7,125.

2.2 Current Hatchery Programs Affecting this Population

Lyons Ferry and Nez Perce Tribal hatcheries spawn fall Chinook for releases into the Snake River Basin. The WDFW releases both yearling and subyearling fall Chinook at Lyons Ferry Hatchery, and it releases subyearlings into the Snake River near Couse Creek (downstream of the Captain John Acclimation site). Lyons Ferry is capacity-limited and unable to separately rear all of the groups of fish, so Umatilla and Irrigon hatcheries are shipped eggs to ensure enough fish are produced to meet the release goals stated in US v Oregon mandates.

Currently, 20% of the run (tagged and untagged) to Lower Granite Dam is trapped and sampled. Fish are shipped to Lyons Ferry and Nez Perce Tribal hatcheries for broodstock, and data collected are used to estimate the run to the dam. In addition, fish are trapped downstream of Lower Granite Dam at Lyons Ferry Hatchery to supplement broodstock. Nez Perce Tribal Hatchery also traps fish at their hatchery.

In 2003, the program began including unmarked/untagged hatchery females in an effort to include wild fish and untagged in-basin hatchery fish in production. Scale analysis is used to differentiate wild from hatchery-origin fish, but as of 2007, it was unable to determine in-basin from out-of-basin hatchery fish. DNA was used in 2007 to determine origins of untagged hatchery fish, but it was only able to assign origins to approximately 30% of the fish with 85% confidence. WDFW is seeking to identify ways to tag production for a more accurate determination of origin of returning adults. At the end of the season, any fall Chinook not needed for production are hauled back to the Snake River to “supplement” the natural population. Adult holding, spawning, egg incubation and juvenile rearing occur at Lyons Ferry and Nez Perce Tribal hatcheries. Incubation and rearing may also occur at Oxbow, Irrigon, and Umatilla hatcheries.

Fall Chinook salmon production in the Clearwater River occurs through two programs – the Lower Snake River Compensation Plan/Fall Chinook Acclimation Project and the Nez Perce Tribal Hatchery.

The Fall Chinook Acclimation Project uses three facilities: (1) Pittsburg Landing, located on the Idaho side of the Snake River at River Mile (RM) 215, approximately 31 miles downstream of Hells Canyon Dam, (2) Captain John Rapids, located on the Washington side of the Snake River at River Mile (RM) 164, and (3) Big Canyon Creek, located on the lower Clearwater River near Peck, Idaho at (RM) 35. The project began operation to release yearlings at Pittsburg Landing in 1996, Big Canyon Creek in 1997, and Captain John Rapids in 1998. In addition, subyearling fall Chinook salmon, the predominant emigration life history characteristic, have been available for release in most years from the Fall Chinook Acclimation Project facilities since 1997. The acclimation facilities at Pittsburg Landing and Big Canyon consist of 16 circular tanks (6 m diameter). Captain

John Rapids consists of a single in-ground 150' x 50' acclimation pond lined with natural river rock. Water is supplied to the facilities pumped directly from the river.

The acclimation goal for the FCAP facilities is 450,000 yearlings (150,000 at each facility) released at 10 fish/lb around mid-April, and 1,400,000 subyearlings (500,000 at each Captain John Rapids and Big Canyon Creek and 400,000 at Pittsburg Landing) released at 50 fish/lb around the end of May. Nez Perce Tribal Hatchery was constructed in 2001 and is authorized to produce 1.4 million subyearling fall Chinook juveniles. Targeted releases are 500,000 smolts on station at Site 1705; 500,000 smolts acclimated and released from the North Lapwai Valley facility; 200,000 smolts acclimated and released from Lukes Gulch facility (South Fork Clearwater); and 200,000 smolts acclimated and released from Cedar Flats facility (Selway River).

The Nez Perce Tribal Hatchery on-station release of 500,000 sub-yearlings is scheduled to occur June 15th. Of these, 100,000 smolts will be adipose fin-clipped and receive coded wire-tags. An additional 200,000 smolts will receive wire only. Approximately 3,000 smolts will receive PIT-tags. Approximately 200,000 sub-yearlings are slated for release from the North Lapwai Valley Acclimation facility. The transfer of the fish occurs in mid- to late-April. Prior to release, 3,000 fish will be adipose fin-clipped and coded wire-tagged. One release component will receive wire only and approximately 3,000 fish will be PIT-tagged. Fish are scheduled to be released May 5th. The Cedar Flats and Lukes Gulch release groups (release plan = 200,000 smolts at each site) are transferred to acclimation sites in late April through early May. The scheduled release dates for both groups is June 15th. Approximately 100,000 fish from each release group receive coded wire-tags. An additional 8,178 fish from each release group receive PIT-tags.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated programs: 7,100 fall Chinook of Snake River hatchery-origin
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: Approximately 300 fish were assumed in the AHA modeling. Observed out-of-basin hatchery strays to Lower Granite Dam have ranged from 280-2,170 fish each year since 2003. Based on coded wire-tags and Blank wire-tags, the main contributors to strays are yearling fall Chinook reared at Bonneville National Fish Hatchery and released into the Umatilla River. These fish originate from Umatilla broodstock. WDFW occasionally recovers fish from Priest Rapids and Klickitat hatcheries.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the

potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.8 to 1.6. Average abundance of natural origin spawners (NOS) would decrease from approximately 1,737 fish to approximately 1,661 fish. Harvest contribution of the natural and hatchery populations would go from 18,767 fish to approximately 1,924 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Congress authorized the Lower Snake River Compensation Plan (LSRCP) in 1976. As a result of that plan, Lyons Ferry Hatchery (LFH) was constructed and has been in operation since 1984. One objective of the hatchery was to compensate for an estimated annual loss of 18,300 adult, Snake River stock, fall Chinook salmon (U.S. Army Corps of Engineers 1975). This mitigation program was modified in the early 1990s by agreement of the United States v. Oregon parties to supplement natural fall Chinook production above Lower Granite Dam. This action was consistent with the U.S. Endangered Species Act and Washington's Wild Salmonid Policy. The WDFW has two general goals in its fall Chinook evaluation program: (1) monitor hatchery practices at LFH to ensure quality smolt releases, high downstream migrant survival, and sufficient adult fish contribution to fisheries and escapement to meet the LSRCP compensation goals; and (2) gather

genetic information to help maintain the integrity of the Snake River Basin fall Chinook salmon stock (WDF 1994). (Lyons Ferry Hatchery Evaluation Fall Chinook Salmon Annual Report: 2005, April 2007). The current hatchery program releases 5.8 million smolts into the Snake River at various locations.

Managers have not assigned a population designation for Snake River Fall Chinook although conservation and harvest objectives have been identified. Snake and Clearwater River fall Chinook salmon are managed as one population for recovery purposes.

Currently, this program is not meeting the standards for a Contributing or Primary population (currently pNOB = 5%, pHOS = 77%). The hatchery program is providing some conservation benefit to the natural population. The HSRG was unable to develop a solution that achieved the standards of either a Primary or Contributing population under the existing conditions.

Lyons Ferry and Nez Perce Tribal hatcheries spawn fall Chinook for release into the Snake River Basin.

The Lyons Ferry Hatchery produces approximately 900,000 yearling and 3.5 million subyearling juveniles annually. Yearlings are released on-station at the hatchery (450,000), in the Snake River (300,000) and the Clearwater River (150,000). Most of the Snake and Clearwater River smolt releases are associated with the Fall Chinook Acclimation Project, but not those direct stream releases at Couse Creek, Lyons Ferry Hatchery, or Hells Canyon Dam. Subyearlings are released on-station at the hatchery (200,000), various locations in the Snake River (2.4 million), in the Grande Ronde River (400,000), and in the Clearwater River (500,000). The Fall Chinook Acclimation Project accounts for 1.4 million of the total subyearling release of 3.5 million.

The Nez Perce Tribal Hatchery also targets the release of 1.4 million subyearlings to the Clearwater River and tributaries annually although this target has not been consistently met.

Adults are collected at Lower Granite Dam, the Lyons Ferry Hatchery and the Nez Perce Tribal Hatchery. Adult holding, spawning, incubation, and juvenile rearing occur at Lyons Ferry and Nez Perce hatcheries. Incubation and rearing may also occur at Oxbow, Irrigon, and Umatilla hatcheries.

The increase in Snake River fall Chinook returns over the last several years is the result of a number of habitat, fish passage, marine survival and hatchery actions together with harvest management.

As currently operated, there is little opportunity for local adaptation and spatial structure in the ESU.

Recommendations

The HSRG looked at various hatchery scenarios that could improve productivity while meeting the standards for a Primary or Contributing population, but could not significantly increase natural-origin spawning under current habitat conditions. To promote spatial structure, local adaptation and to improve productivity, the HSRG recommends that managers pursue development of broodstock collection capabilities for releases into the Clearwater River. Due to the lack of adult capture facilities, the HSRG recommends that managers develop, test and deploy live capture selective fishing gears to collect local Clearwater brood to accomplish this end, provide additional harvest opportunity, and manage pHOS. Managers should avoid removing Clearwater-origin fish at Lower Granite Dam. Managers should also develop similar broodstock collection

capabilities within the Snake River upstream of the confluence of the Clearwater River (e.g., Captain John's, Pittsburg Landing, and Hells Canyon Dam).

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers' discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

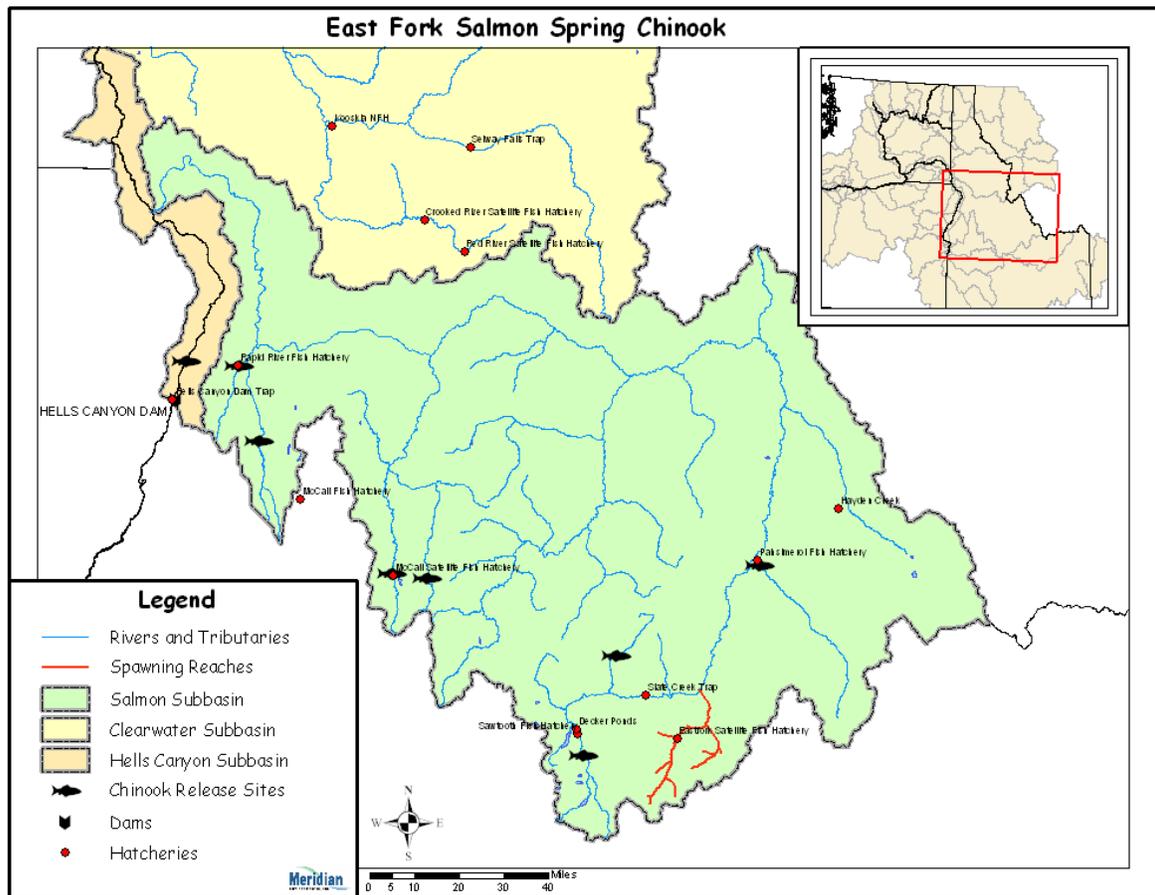
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Lower Snake River Fall Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 5,802.7 | 50% | 0% | 77% | 0.06 | 1,737 | 0.8 | 18,767 | 2,269 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,661 | 1.6 | 1,924 | - |
| HSRG Solution | Int Both | 5,802.7 | 50% | 0% | 75% | 0.06 | 1,729 | 0.8 | 22,925 | 1,538 |
| | | | | | | | | | | |
| HSRG Solution w/ Improve Hab | Int Both | 5,802.7 | 50% | 0% | 73% | 0.06 | 1,952 | 0.9 | 23,198 | 1,538 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

East Fork Salmon River Spring/Summer Chinook Population and Related Hatchery Programs

January 31, 2009



1 East Fork Salmon Spring/Summer Chinook

The East Fork Salmon River Chinook population is part of the Snake River Spring/Summer Chinook ESU. The East Fork Salmon River population is a spring/summer run and is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) classified this population as “Large” based on its historic habitat potential. A “Large” population is one that requires a minimum abundance of 1,000 wild spawners and an intrinsic productivity greater than 1.56 recruits per spawner (R/S) to be viable.

Historically, it is estimated that from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPCC 2004). The portion returning to the East Fork Salmon River and Herd Creek is unknown but was likely in the tens of thousands. Spawning likely took place in the mainstem, Herd Creek and several small tributaries.

2 Current Conditions

The East Fork Salmon Chinook population is considered a spring/summer run. Adult returns to the subbasin consist of both hatchery- and natural-origin fish. With the exception of Rapid River stock, natural- and hatchery-origin Chinook in the Salmon River drainage are listed as Threatened. Since 1997, an experimental conservation hatchery program has operated in the East Fork Salmon River. This program releases maturing adults to the river to spawn volitionally. Adults are developed from eggs sourced from natural redds using hydraulic extraction methods. The program is currently assessing the contribution to the next generation from captive adult outplants.

Spawning occurs from mid-July through late September. Juveniles leave the system as yearlings starting in early March and continuing into the spring.

Current (1960 to 2005) abundance (number of adults spawning in natural production areas) has ranged from 11 fish in 1995 to 3,374 fish in 1961. Abundance in recent years has been moderately variable. The most recent 10-year geometric mean number of natural-origin spawners was 169 fish (NOAA Draft Recovery Plan). Redd count averages in index areas generally were less than 100 from 1992 to 2003 (StreamNet).

AHA modeling data submitted by IDFG estimate current adult escapement and adjusted productivity for the natural-origin population at 138 and 0.67, respectively. The model also estimates that five hatchery-origin spring and summer Chinook stray into this population each year (estimate does not include potential straying impact of adults released through captive rearing program).

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRF assigned this population as Contributing. The population currently meets the broodstock criteria for a Primary population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the East Fork Salmon River spring/summer Chinook population as “Large”, and identified a minimum abundance threshold of 1,000 natural-origin adults.

- Productivity Improvement Expectation: The ICTRT productivity standard associated with a population defined as “Large” is 1.56.
- Habitat Productivity and Capacity: Productivity: 1.46; Capacity: 1,500

2.2 Current Hatchery Programs Affecting this Population

The IDFG also operates a conservation broodstock program in the East Fork Salmon River. This program returns approximately 100 hatchery-reared Chinook salmon to natal spawning areas annually (ongoing since 1997). Fish are reared at the IDFG Eagle Fish Hatchery through smoltification then transferred to NOAA’s Manchester Research Station for rearing on seawater through maturation. The IDFG is currently assessing whether successful next generation production occurs from the release of prespawners adults.

In 1991, IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook supplementation study that will continue through 2012. The study incorporates treatment and control streams in the Clearwater and Salmon subbasins. The East Fork Salmon River is a treatment stream for this program. “Treatments” include the development and release of “supplementation” smolts (hatchery x natural parents) and the release of “supplementation” adults to treatment spawning streams (50:50 hatchery: natural-origin release design). In 2004, juvenile treatments ended in all but three study streams. In 2007, adult treatments ended. The study will conclude in 2014 following a five-year period of “no treatment.”

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: five fish. Projected strays are produced primarily from the segregated program operating at the Sawtooth Fish Hatchery.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The

solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.0 to 1.4. Average abundance of natural-origin spawners (NOS) would increase from approximately 134 fish to approximately 435 fish. The harvest contribution of the natural and hatchery populations would go from approximately 15 fish to 47 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for East Fork Salmon River Chinook salmon that emphasizes maintaining existing natural spawning populations. Currently this population is consistent with the HSRG-defined standards of a Primary population in terms of hatchery influence (PHOS less than 0.05), although abundance levels are low.

The IDFG operates a conservation hatchery program in the East Fork Salmon River. Ongoing since 1997, this program sources eggs from natural redds. Fish are reared at the IDFG Eagle Fish Hatchery through smoltification then transferred to NOAA's Manchester Research Station for rearing on seawater through maturation. Adults are trucked back to natal waters and released for natural spawning. The last release of adults in the East Fork Salmon River will be in 2009. IDFG is currently assessing the production potential of this conservation strategy.

Recommendations

The HSRG recommends that managers continue to monitor status and trend information for this natural population as well as the proportion of hatchery fish in natural production areas.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

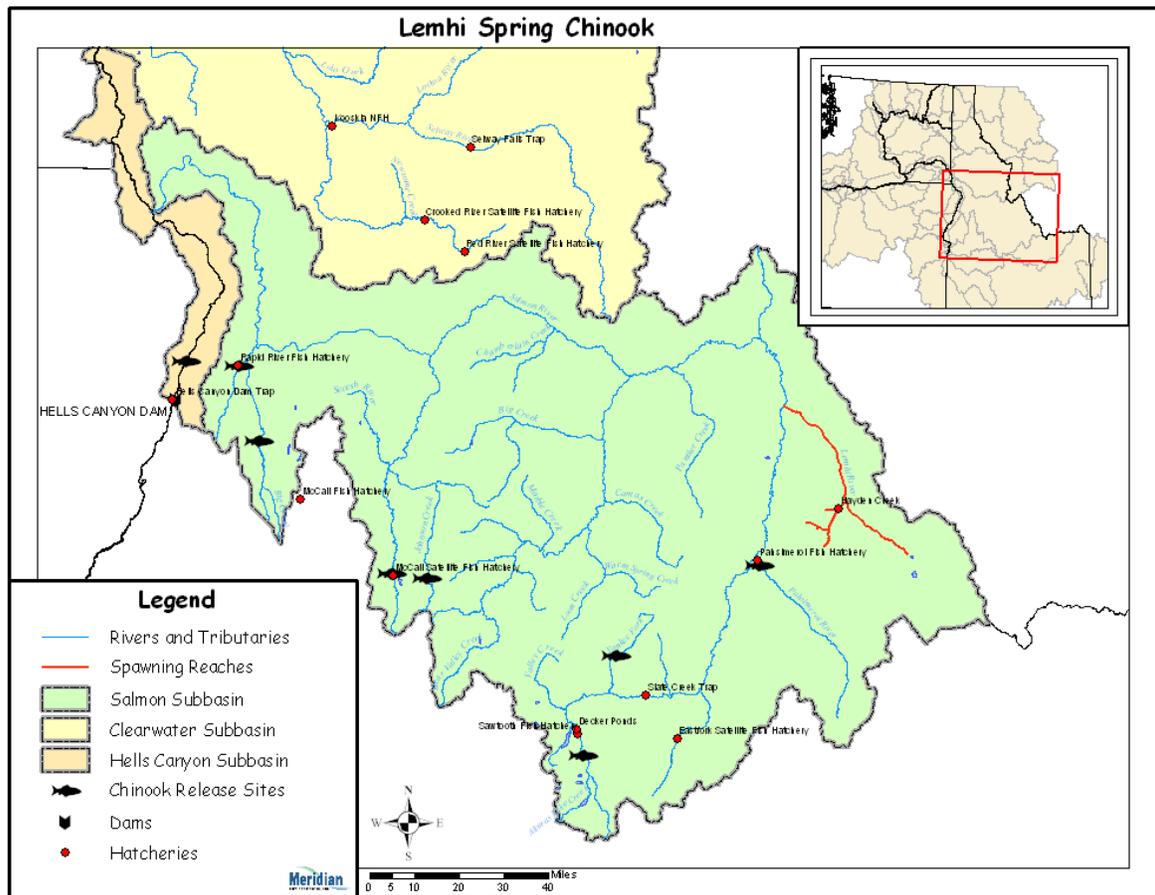
Table 1. Results of HSRG analysis of current condition and HSRG Solution for East Fork Salmon River Spring/Summer Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 3% | 0.00 | 134 | 1.0 | 15 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 435 | 1.4 | 47 | - |
| HSRG Solution | None None | - | 0% | 0% | 3% | 0.00 | 188 | 1.1 | 21 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 501 | 1.4 | 55 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon Lemhi River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Salmon Lemhi River Spring Chinook

The Lemhi River Chinook population is part of the Snake River Spring/Summer Chinook ESU. This population is a spring run and is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) has classified this population as “Very Large” based on its historic habitat potential. A “Very Large” population is one that requires a minimum abundance of 2,000 wild spawners and an intrinsic productivity greater than 1.34 recruits per spawner (R/S) to be viable.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPCC 2004). The portion returning to the Lemhi River is unknown but was probably in the tens of thousands.

2 Current Conditions

Adult spring Chinook returns to the subbasin consist of both natural-origin fish and a few hatchery strays from outside the population. With the exception of Rapid River stock, natural- and hatchery-origin Chinook in the Salmon River drainage are listed as Threatened. Fish spawn primarily in the Lemhi River and Hayden Creek, with the majority spawning in the Lemhi River upstream of Hayden Creek near Leadore. Spawning occurs from mid-July through late September. Juvenile emigrants exhibit both a sub-yearling and yearling life-history. A portion of the Lemhi River is currently inaccessible due to tributary dewatering. Most habitat is privately held and ranched.

Current (1957 to 2003) natural abundance (number of adult spawning in natural production areas) has ranged from 10 fish (1995) to 3,357 fish (1961). Abundance has been variable in recent years. The most recent 10-year geometric mean number of natural spawners was 80 fish (NOAA Draft Recovery Plan). Redd counts in the Lemhi River have generally been less than 100 from 1992-2003 (StreamNet).

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 406 and 1.13, respectively. The model also estimates that four hatchery-origin Chinook salmon stray into this population each year. There is no Chinook hatchery program operating in the Lemhi River.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Lemhi River spring Chinook population as “Very Large” and identified a minimum abundance threshold of 2,000 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Very Large” is 1.34.
- **Habitat Productivity and Capacity:** Productivity: 1.31; Capacity: 3,900

2.2 Current Hatchery Programs Affecting this Population

There is no hatchery stock associated with this Chinook population. AHA modeling indicates however that some hatchery strays from the following programs may spawn in the Lemhi River:

- Salmon/ Little Salmon Spring Chinook (Rapid River Hatchery)
- Salmon/ East Fork/South Fork Johnson Creek Summer Chinook
- Salmon/ South Fork Salmon Summer Chinook (McCall Hatchery)
- Salmon/Pahsimeroi Summer Chinook (Pahsimeroi Hatchery)

The IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study designed to continue through 2012. The study incorporates treatment and control streams in the Clearwater and Salmon subbasins. The Lemhi River is a Control stream for this program. “Treatments” include the development and release of “supplementation” smolts (hatchery x natural parents) and the release of “supplementation” adults to treatment spawning streams (50:50 hatchery: natural-origin release design). In 2004, juvenile treatments ended in all but three study streams. In 2007, adult treatments ended. The study will conclude in 2012 following a five-year period of “no treatment” evaluation.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: four fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.1 to 1.3. Average abundance of natural-origin spawners (NOS) would increase from approximately 398 fish to approximately 786 fish. The harvest contribution of the natural and hatchery populations would go from approximately 43 fish to 86 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Lemhi River Chinook salmon that emphasizes maintaining existing natural spawning populations. Currently this population is consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

The ongoing Idaho Supplementation Study is ending in 2012. Adult returns from this program ended in 2007. The current phase of the study monitors production and productivity in the absence of adult supplementation. Following 2012, managers will have greater flexibility to pursue other management options.

Recommendations

The HSRG recommends that managers continue to monitor status and trend information for this natural population as well as the proportion of hatchery fish in natural production areas.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Lemhi River Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 398 | 1.1 | 43 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 786 | 1.3 | 86 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 593 | 1.2 | 65 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 0.00 | 1,122 | 1.3 | 122 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Lower Salmon Mainstem (~Below Redfish Lake) Spring/Summer Chinook Population and Related Hatchery Programs

January 31, 2009



1 Salmon Below Redfish Lake Spring/Summer Chinook

The Lower Salmon River Chinook population is part of the Snake River Spring/Summer Chinook ESU. This population includes both spring and summer run fish and is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) listed this population as “Very Large” based on its historic habitat potential. A “Very Large” population is one that requires a minimum abundance of 2,000 natural spawners and an intrinsic productivity greater than 1.34 recruits per spawner (R/S) to be viable.

Historically, it is estimated that from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to the Salmon River below Redfish Lake is unknown but was probably in the tens of thousands.

2 Current Conditions

Adult spring/summer Chinook returns to the subbasin consist of both natural-origin and stray hatchery-origin fish. With the exception of Rapid River stock, natural- and hatchery-origin Chinook in the Salmon River drainage are listed as Threatened. This population includes fish spawning in the mainstem of the upper Salmon River from the mouth of the Lemhi River to Redfish Lake Creek, as well as tributaries including Thompson and Squaw creeks. These areas include nearly contiguous spawning aggregates of fish with both summer and spring adult run-timing. Spawning takes place from mid-July through late October. Juveniles leave the system as yearlings starting in early March and continuing into the spring.

Current (1957 to 2005) population abundance (number of adults spawning in natural production areas) has ranged from 11 fish in 1995 to 4,888 fish in 1957. Abundance in recent years has been highly variable. The most recent 10-year geomean number of natural spawners was 123 fish (NOAA Draft Recovery Plan).

AHA modeling data submitted by IDFG estimate current adult escapement and adjusted productivity for the natural-origin population at 97 and 0.69, respectively. The model also estimates that 10 hatchery-origin spring and summer Chinook stray into this population each year. There is no hatchery program associated with this population.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Contributing. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Lower Mainstem Salmon River spring/summer Chinook population as “Very Large”, and identified a minimum abundance threshold of 2,000 natural-origin adults
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Very Large” is 1.34.
- **Habitat Productivity and Capacity:** Productivity: 1.5; Capacity: 2,000

2.2 Current Hatchery Programs Affecting this Population

There is no hatchery program that releases juveniles into this portion of the Upper Salmon River. According to AHA modeling results, it is likely that spring and summer hatchery adults from the following programs may stray and therefore spawn with this natural population:

- Salmon/ Little Salmon Spring Chinook (Rapid River Hatchery)
- Salmon/ East Fork/South Fork Johnson Creek Summer Chinook
- Salmon/ SF Salmon Summer Chinook (McCall Hatchery)
- Salmon Pahsimeroi Summer Chinook (Pahsimeroi Hatchery)
- Salmon/ Upper Salmon Mainstem (Sawtooth Hatchery)

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 10 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.0 to 1.4. Average abundance of natural-origin spawners (NOS) would increase from approximately 186 fish to approximately 621 fish. The harvest contribution of the natural and hatchery populations would go from approximately 20 fish to 68 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Lower Mainstem Salmon River Chinook salmon that emphasizes maintaining existing natural spawning populations. Currently this population is consistent with the HSRG-defined standards of a Contributing population in terms of hatchery influence (pHOS less than 0.1), although abundance levels are low.

Recommendations

The HSRG recommends that managers continue to monitor status and trend information for this natural population as well as the proportion of hatchery fish in natural production areas.

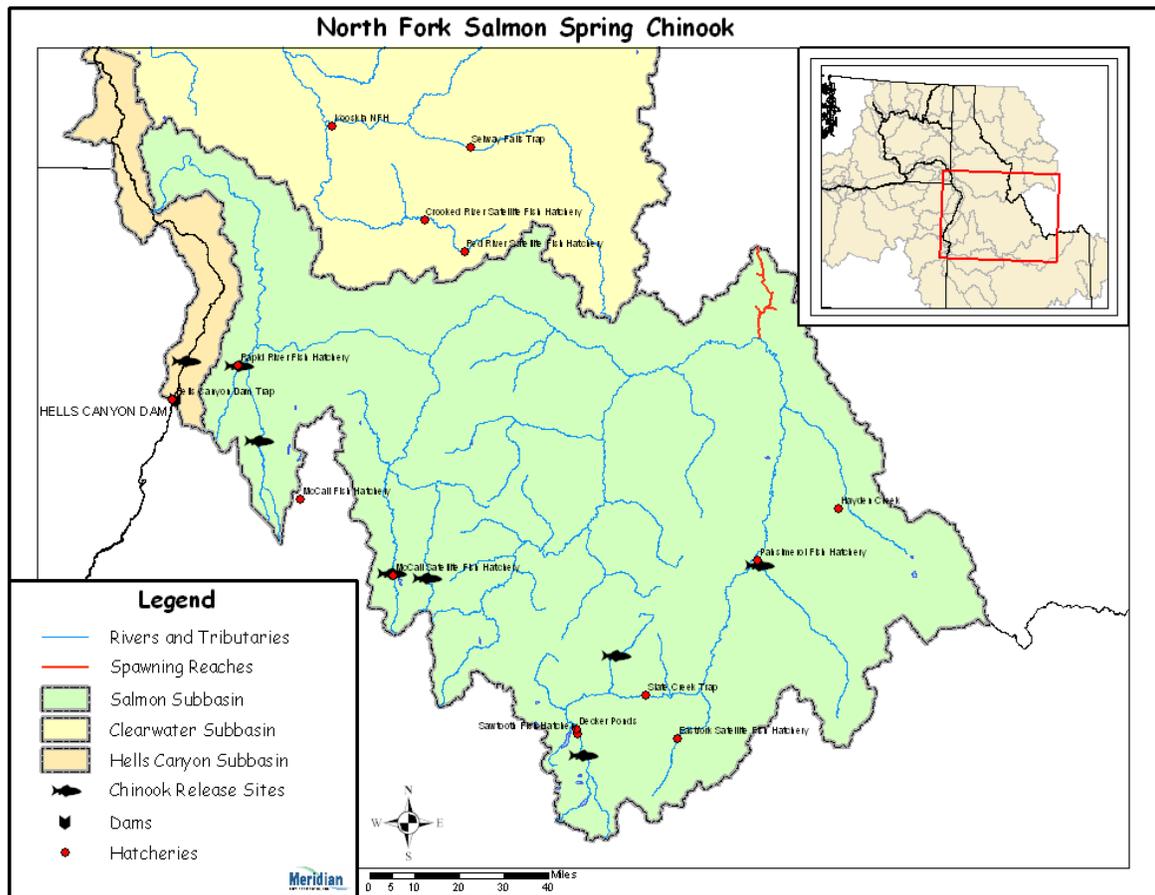
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Salmon River Spring Chinook Below Redfish Lake. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 4% | 0.00 | 186 | 1.0 | 20 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 0.00 | 621 | 1.4 | 68 | - |
| | | | | | | | | | | |
| HSRG Solution | None None | - | 0% | 0% | 5% | 0.00 | 211 | 1.0 | 23 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 2% | 0.00 | 658 | 1.4 | 72 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

North Fork Salmon River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 North Fork Salmon River Spring Chinook

The North Fork Salmon Chinook population is part of the Snake River Spring/Summer Chinook ESU. This population is characterized as a spring run adult life history type and is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) listed this population as “Basic” based on its historic habitat potential. A “Basic” population is one that requires a minimum abundance of 500 natural spawners and an intrinsic productivity greater than 2.21 recruits per spawner (R/S) to be viable.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPCC 2004). The portion returning to the North Fork Salmon River is unknown but was probably in the low thousands.

2 Current Conditions

Adult spring Chinook returns to the basin consist of both natural-origin and a few hatchery strays from outside the population. With the exception of Rapid River stock, natural- and hatchery-origin Chinook in the Salmon River drainage are listed as Threatened. The population includes the North Fork Salmon River and all tributaries downstream to the mouth of Panther Creek. Spawning takes place from mid-July through late September in the North Fork Salmon and major tributaries. Juveniles emigrate from the system as yearlings in the spring of the year.

Current natural population abundance (number of adults spawning in natural production areas) is unknown for this population. Between 1990 and 2006, redd counts in the North Fork Salmon River have averaged approximately 20 fish (StreamNet).

AHA modeling data submitted by IDFG estimate current adult escapement and adjusted productivity for the natural-origin population at 35 and 0.73, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Contributing. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the North Fork Salmon River population as “Basic” and identified a minimum abundance threshold of 500 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Basic” is 2.21.
- **Habitat Productivity and Capacity:** Productivity: 1.6; Capacity: 550

2.2 Current Hatchery Programs Affecting this Population

There is no hatchery stock associated with this Chinook population. AHA modeling indicates however that some hatchery strays from the following programs may spawn in the North Fork Salmon River:

- Salmon/ Little Salmon Spring Chinook (Rapid River Hatchery)
- Salmon/ East Fork/South Fork Johnson Creek Summer Chinook
- Salmon/ South Fork Salmon Summer Chinook (McCall Hatchery)
- Salmon Pahsimeroi Summer Chinook (Pahsimeroi Hatchery)

The IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study designed to continue through 2012. The study incorporates treatment and control streams in the Clearwater and Salmon subbasins. The North Fork Salmon River is a Control stream for this program. “Treatments” include the development and release of “supplementation” smolts (hatchery x natural parents) and the release of “supplementation” adults to treatment spawning streams (50:50 hatchery: natural-origin release design). In 2004, juvenile treatments ended in all but three study streams. In 2007, adult treatments ended. The study will conclude in 2014 following a five-year period of “no treatment.”

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: Four fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.0 to 1.5. Average abundance of natural-origin spawners (NOS) would increase from approximately 59 fish to approximately 197 fish. The harvest contribution of the natural and hatchery populations would go from approximately six fish to 22 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for North Fork Salmon River Chinook salmon that emphasizes maintaining existing natural spawning populations. Currently this population is consistent with the HSRG-defined standards of a Contributing population (pHOS less than 0.10) although abundance levels are low.

The ongoing Idaho Supplementation Study is ending in 2012. Adult returns from this program ended in 2007. The current phase of the study monitors production and productivity in the absence of adult supplementation. Following 2012, managers will have greater flexibility to pursue other management options.

Recommendations

The HSRG recommends that managers continue to monitor status and trend information for this natural population as well as the proportion of hatchery fish in natural production areas.

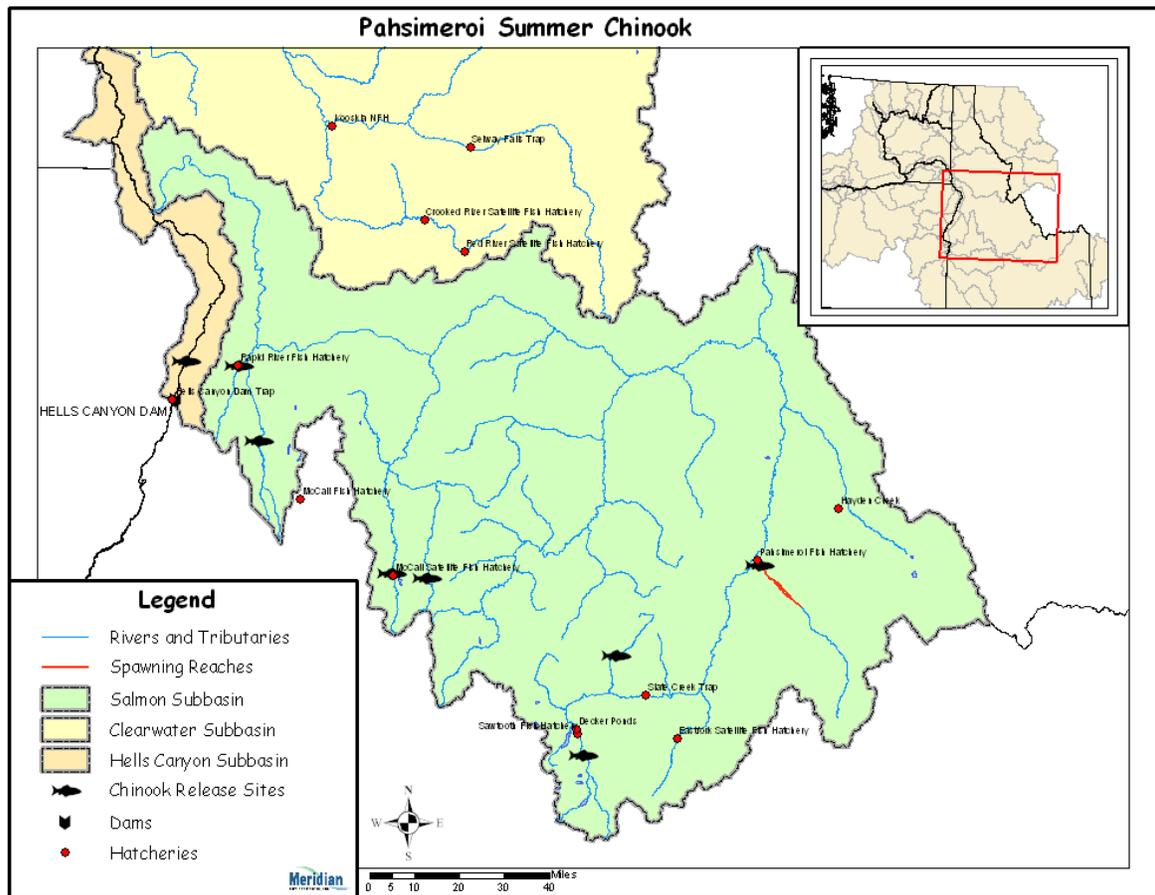
Table 1. Results of HSRG analysis of current condition and HSRG Solution for North Fork Salmon Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 5% | 0.00 | 59 | 1.0 | 6 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 197 | 1.5 | 22 | - |
| HSRG Solution | None None | - | 0% | 0% | 8% | 0.00 | 53 | 0.9 | 6 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 3% | 0.00 | 164 | 1.4 | 18 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Pahsimeroi River Summer Chinook Population and Related Hatchery Programs

January 31, 2009



1 Pahsimeroi Summer Chinook

The Pahsimeroi River Chinook population is part of the Snake River Spring/Summer Chinook ESU. This population is a summer run and is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) identifies this population as “Large” based on its historic habitat potential. A “Large” population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.56 recruits per spawner (R/S) to be viable.

Historically, it is estimated that from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPCC 2004).

2 Current Conditions

The Pahsimeroi Chinook population is primarily a summer run. Adult returns to the subbasin consist of both hatchery- and natural-origin fish, as there is a segregated hatchery program present. With the exception of Rapid River stock, natural- and hatchery-origin Chinook in the Salmon River drainage are listed as Threatened. Spawning occurs from mid-August through late October in the lower portion of the river. Upstream habitat is fragmented or partially blocked. Juveniles leave the system as both sub-yearlings and yearlings starting in early March and continuing through the fall.

Abundance in recent years has been highly variable. The most recent 10-year geometric mean number of natural spawners in the Pahsimeroi River was 112 fish. Current (1986 to 2005) population abundance (number of adults spawning in natural production areas) has ranged from 27 fish in 1995 to 763 fish in 2003 (NOAA Draft Recovery Plan). From 1992 to 2003, index area redd counts have ranged from less than 50 to 350 (StreamNet).

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 130 and 0.72, respectively. The model also estimates that 50 hatchery-origin spring and summer Chinook stray into this population each year. The low number of hatchery fish present in the basin is due to the presence of a weir that removes 95% of the hatchery fish.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for a Stabilizing population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Pahsimeroi River summer Chinook population as “Large” and identified a minimum abundance threshold of 1,000 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Large” is 1.56.
- **Habitat Productivity and Capacity:** Productivity: 1.70; Capacity: 3,200

2.2 Current Hatchery Programs Affecting this Population

The Pahsimeroi Fish Hatchery was constructed in 1968 by the Idaho Power Company (IPC) as part of its program to mitigate for losses of anadromous fish associated with the construction and operation of the Hells Canyon Complex. Originally it was a trapping and spawning facility for summer steelhead and an acclimation facility for steelhead smolts reared at IPC's Niagara Springs Fish Hatchery. Following implementation of the Hells Canyon Settlement Agreement in 1980, the role of Pahsimeroi Fish Hatchery was expanded to include the production of one million summer Chinook salmon smolts annually. The Pahsimeroi Fish Hatchery is comprised of upper and lower hatchery components. The lower component is located on the Pahsimeroi River approximately 1.6 kilometers above its confluence with the main Salmon River near Ellis, Idaho. The upper component is located approximately 11.3 kilometers further upstream from the lower facility on the Pahsimeroi River. This facility was completely renovated by Idaho Power in 2006-07 to reduce the impacts of whirling disease on hatchery reared fish.

The current program goal is to volitionally release approximately 1,000,000 yearling Chinook salmon smolts to the Pahsimeroi River directly from the upper facility rearing ponds. Actual release numbers have varied; the average has been less than the planning target. Due to the presence of whirling disease in the Pahsimeroi River and the higher incidence of infection in juvenile fish at early life stages, early rearing of Pahsimeroi summer Chinook salmon has occurred at IDFG's Sawtooth Fish Hatchery. In 1991, IDFG began shipping a portion of summer Chinook salmon eyed- eggs produced at Pahsimeroi to the Sawtooth Fish Hatchery to compare whirling disease infection rates between the hatcheries. These studies continued until 1996, when IDFG began shipping all Pahsimeroi summer Chinook salmon eyed-eggs to Sawtooth for incubation and early rearing. At eye-up, eggs were transferred to Sawtooth for hatching and early rearing on pathogen-free well water. Pahsimeroi Fish Hatchery summer Chinook salmon were reared on well water at Sawtooth until they reached a minimum size of 70 mm (or until such time that well water became unavailable, whichever occurred first) before transferring them back to Pahsimeroi for final rearing. Beginning with brood year 2008 incubation and rearing of all Pahsimeroi Hatchery summer Chinook will occur on station in new facilities constructed by IPC at the upper hatchery site. All fish are adipose fin-clipped and a portion coded wire and PIT-tagged for evaluation purposes. The average SAR R/S for the hatchery program is 0.3% and 6.0, respectively.

IDFG's involvement with the culture of summer Chinook at Pahsimeroi dates back to 1969, with eggs collected from summer Chinook salmon at the lower hatchery site, shipped to IDFG's Mackay Hatchery for rearing, and then returned to Pahsimeroi Fish Hatchery for acclimation and release as sub-yearlings or yearling smolts. Indigenous Pahsimeroi River summer Chinook salmon were solely used for propagation from 1969 until 1981. The Pahsimeroi Fish Hatchery summer Chinook salmon mitigation program began in 1981 with the collection of eggs from four indigenous Pahsimeroi River female summer Chinook and the receipt of 616,823 spring Chinook salmon eggs from IPC's Rapid River Fish Hatchery. From brood year 1981 through 1984, Rapid River spring Chinook salmon stock and IDFG's Hayden Creek Hatchery (Lemhi River) spring Chinook salmon stock were used in an effort to achieve smolt production goals and expedite the return of harvestable numbers of Chinook salmon to the Salmon and Pahsimeroi rivers. Summer Chinook salmon production also continued during this period. The Chinook salmon program at Pahsimeroi Fish Hatchery converted back solely to a summer Chinook salmon program, with the last adult spring Chinook salmon returning in 1989. In the 1980s, IDFG transferred eggs from the South Fork Salmon

River summer Chinook program to the Pahsimeroi Hatchery to meet broodstock needs. Since 1989, broodstock have been taken exclusively from returns to the Pahsimeroi Fish Hatchery.

The Pahsimeroi Fish Hatchery has been part of The Idaho Supplementation Study (ISS). In 1991, IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study designed to continue through 2012. The study incorporates treatment and control streams in the Clearwater and Salmon subbasins. The Pahsimeroi River is a treatment stream for this program. “Treatments” include the development and release of “supplementation” smolts (hatchery x natural parents) and the release of “supplementation” adults to treatment spawning streams (50:50 hatchery: natural-origin release design). In 2004, juvenile treatments ended in all but three study streams. In 2007, adult treatments ended. The study will conclude in 2014 following a five-year period of “no treatment.”

Managers have agreed to plan and implement an integrated Chinook salmon supplementation program in the Pahsimeroi River beginning no earlier than spawn year 2009.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 50 fish. Projected strays are produced primarily (47 fish) from the segregated program operating at the Pahsimeroi Fish Hatchery.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.7 to 1.5. Average abundance of natural-origin spawners (NOS) would increase from approximately 130 fish to approximately 1,026 fish. The harvest contribution of the natural and hatchery populations would go from approximately 1,017 fish to 205 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Pahsimeroi River summer Chinook that emphasizes maintaining existing natural spawning populations as well as maintaining the current hatchery mitigation program. Currently this population is not consistent with the HSRG-defined standards of either a Primary or Contributing population (pHOS greater than 0.10). Based on the information provided, it appears that there is significant habitat capacity that is not used. Managers have also identified the potential to improve habitat connectivity within this subbasin.

The mitigation goal for the Idaho Power Company-funded mitigation program that operates in the Pahsimeroi River is to produce 1 million smolts for release annually.

The current segregated harvest program collects broodstock from rack returns at the Pahsimeroi Fish Hatchery. Beginning with brood year 2008, all adult holding, spawning, incubation and rearing will occur at this location. The current production target for the program is 1.0 million yearling smolts; however, due to insufficient adult returns, this target is not consistently met. Average SAR and R/S values for hatchery-produced fish are 0.3% and 6.0, respectively.

The ongoing Idaho Supplementation Study is ending in 2012. Adult returns from this program ended in 2007. The current phase of the study monitors production and productivity in the absence of adult supplementation. Following 2012, managers will have greater flexibility to pursue other management options.

IDFG's implementation of BKD risk management strategies, including culling, has been very successful.

Recommendations

The HSRG recommends that managers implement a two-stage stepping stone program to support the natural population and to provide harvest. The program consists of an integrated conservation component producing approximately 285,000 smolts (PNI = 0.74, pHOS = 0.31, pNOB = 75%). Initially, this component would be produced from 100% NOB but subsequent generations would be maintained by collecting 75% natural-origin broodstock and 25% hatchery-origin returns from this integrated component. Integrated adult returns not needed to maintain the integrated broodstock would be used as broodstock for the second stage harvest component to produce approximately 1 million smolts. This maintains some genetic continuity between the harvest component and natural fish returning to the system. Smolts produced through the integrated program could be adipose fin-clipped if sufficient numbers returned to meet escapement needs, integrated broodstock needs, as well as second stage stepping stone broodstock needs. Managers should monitor this closely and revert to code wire only if insufficient adults return to meet all needs. Smolts produced for harvest would be adipose fin-clipped. Unharvested “harvest component” fish would not be used for broodstock, released upstream of the weir, or returned to population downstream of the weir. Unharvest adults could be used for stream nitrification as appropriate.

The HSRG acknowledges that managing for the recommended PNI values may not be possible or appropriate in the near term when abundance levels are low and demographic risks to the population increase. To address this concern, managers should develop a variable sliding scale for managing abundance so that in low abundance years, more hatchery-origin fish of the appropriate population component are allowed to reach the spawning grounds to reduce demographic risk to the respective populations.

An example of such a sliding scale would look like this:

Each year, depending on NOR run size, pNOB and pHOS are allowed to “float” or slide. The HSRG assumes managers will establish an acceptable level of removal of NORs for use in the hatchery brood. This will be a fixed percentage of the total NOR return (say 40%) and will not change, regardless of NOR return. In years of high NOR abundance, this 40% could make up 100% of the needed hatchery brood (pNOB= 100%). In that case, no HORs would be used in the hatchery brood. Hatchery fish can be allowed to reach the spawning ground (pHOS) if needed to achieve an appropriate number of fish spawning naturally (demographic benefit and use of available habitat). This however, would not be required during years of very high NOR returns as both objectives (pNOB and natural spawning) may be met with NORs.

In years of low NOR abundance, the same 40% of the NOR return would be removed for use in the hatchery brood (pNOB). However, in these years, that 40% may make up only a small part of the needed brood (i.e. pNOB 10%). In these years, enough HORs should be used to achieve needed hatchery brood and additional HORs should be allowed to spawn naturally (pHOS) to achieve the minimum acceptable level of naturally spawning.

The goal of this sliding scale is to achieve an “average” PNI over time of the desired level (0.67 or 0.5) depending on the population designation even though it may not be achieved in an one year. A good way to determine the level of NORs that should be removed each year (see above) is to review the return of NORs over a long time frame and iterate what level (30, 40, 50%) are needed, on average, to achieve the desired PNI.

The HSRG also recommends that the managers continue to implement their apparently successful BKD strategies, which include culling.

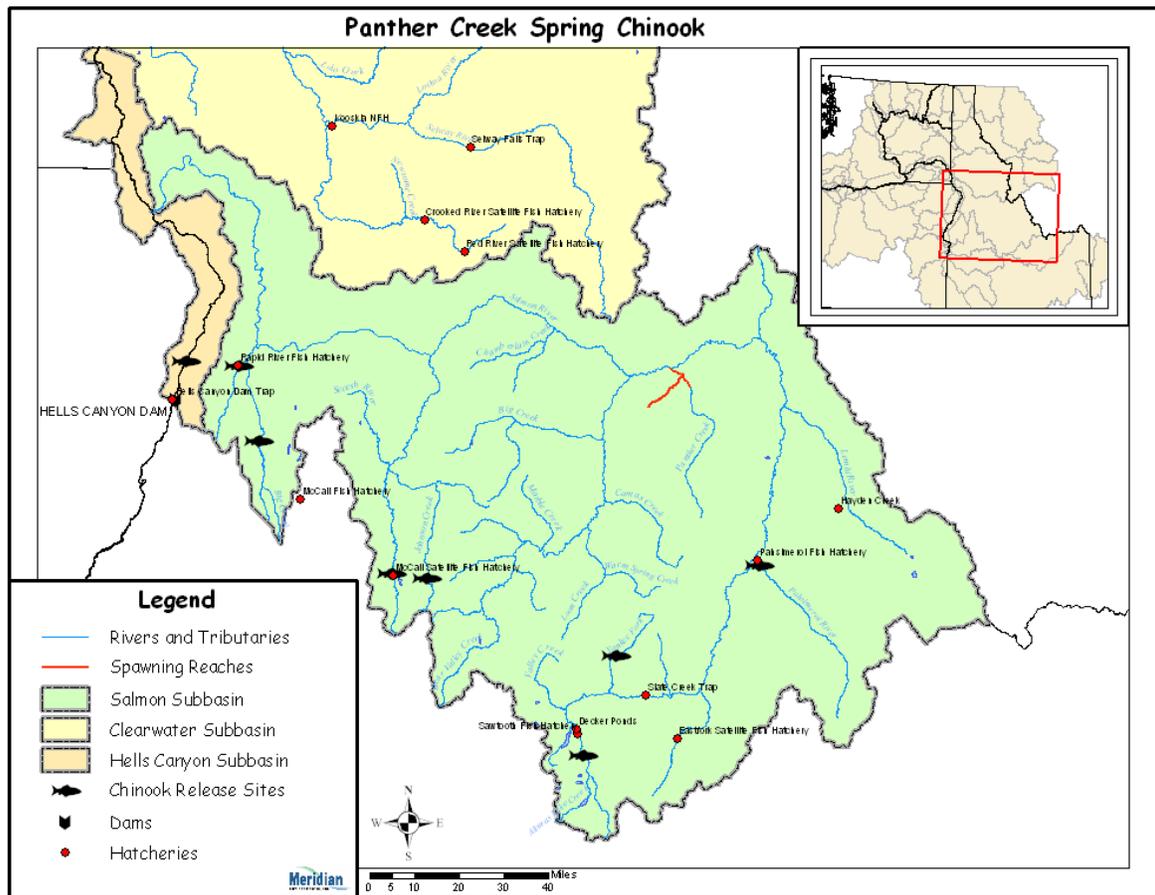
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Pahsimeroi River Summer Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 95% | 0% | 23% | 0.00 | 130 | 0.7 | 26 | 0 |
| | Seg Harv | 999.4 | 95% | | | | | | 991 | 1,998 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,026 | 1.5 | 205 | - |
| HSRG Solution | Int Cons | 285.0 | 50% | 0% | 28% | 0.73 | 1,007 | 1.3 | 402 | 58 |
| | Stepping Stone/Seg Harv | 1,045.0 | 95% | | | | | | 2,390 | 1,543 |
| HSRG Solution w/ Improved Habitat | Int Cons | 285.0 | 50% | 0% | 23% | 0.77 | 1,299 | 1.5 | 461 | 58 |
| | Stepping Stone/Seg Harv | 1,045.0 | 95% | | | | | | 2,390 | 1,543 |

Hatchery Scientific Review Group Review and Recommendations

Salmon Panther Creek Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Salmon-Panther Creek Spring Chinook

This Panther Creek population is part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) has classified this population of Chinook as Extirpated. This population was extirpated from the Panther Creek drainage in the 1960s primarily due to mining activities.

2 Current Conditions

The Panther Creek drainage downstream of and including Blackbird Creek has been impacted by chemical contamination and is under a U.S. Environmental Protection Agency supervised cleanup. Concerns upstream of Blackbird Creek include altered riparian habitat, increased sediment and fish passage barriers (NPCC 2004).

By the 1970s, the endemic Chinook were extirpated due to acid and heavy metal pollution from cobalt mining operations. Panther Creek has since been stocked several times with hatchery fish from a variety of stocks. This creek has been determined to be sufficiently distant from other spawning aggregates and has sufficient available habitat to be considered a separate, independent population (ICTRT 2003) but at this time is classified as extirpated.

Habitat quality in Panther Creek and tributaries appears to be relatively good as the stream supports some bull trout and steelhead.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA; however, this population has been extirpated.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Stabilizing. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Panther Creek population as “intermediate” and identified a minimum abundance threshold of 750 natural-origin adults.
- **Productivity Improvement Expectation:** Increase to 1.8 over time as habitat actions designed to improve the abundance and productivity of ESA listed steelhead, sockeye and Chinook are implemented.
- **Habitat Productivity and Capacity:** Productivity: 0.10; Capacity: 1,200

2.2 Current Hatchery Programs Affecting this Population

No Chinook salmon hatchery programs operate in the vicinity of Panther Creek. AHA modeling indicates however that some hatchery strays from the following programs have the potential to spawn in Panther Creek:

- Salmon/ Little Salmon Spring Chinook (Rapid River Hatchery)
- Salmon/ East Fork/South Fork Johnson Creek Summer Chinook
- Salmon/ South Fork Salmon Summer Chinook (McCall Hatchery)

- Salmon/ Pahsimeroi Summer Chinook (Pahsimeroi Hatchery)

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 4 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from zero to 0.1. Average abundance of natural-origin spawners (NOS) would be unchanged at 0 fish. The harvest contribution of the natural and hatchery populations would remain at 0 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

| |
|---|
| <p>Observations</p> <p>This population is extirpated.</p> <p>Recommendations</p> <p>The HSRG has no specific recommendations for Panther Creek.</p> |
|---|

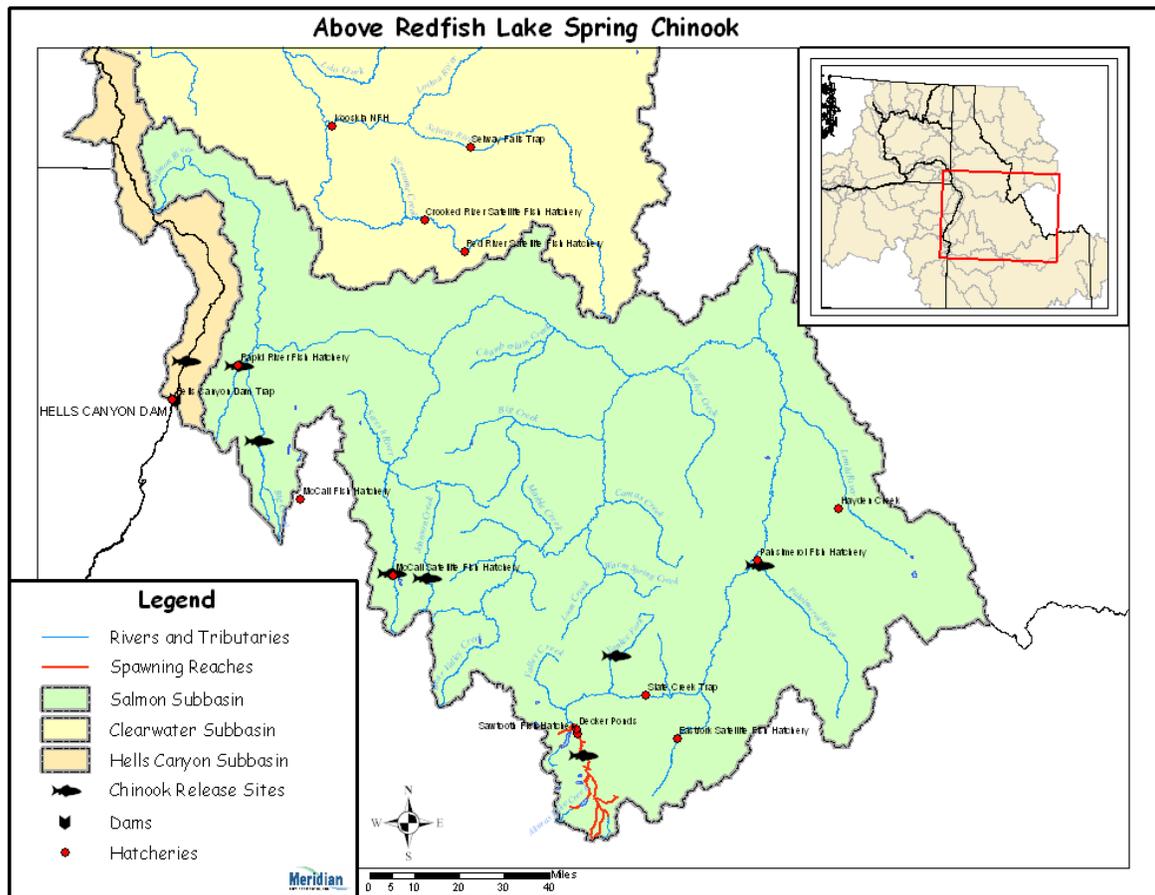
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Panther Creek Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the addition effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 94% | 0.00 | 0 | 0.0 | 0 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 0 | 0.1 | 0 | - |
| HSRG Solution | None None | - | 0% | 0% | 94% | 0.00 | 0 | 0.0 | 0 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 93% | 0.00 | 0 | 0.1 | 0 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon River Above Redfish Spring/Summer Chinook Population and Related Hatchery Programs

January 31, 2009



1 Salmon River Spring Chinook Above Redfish Lake Creek

The Upper Salmon River Chinook population is part of the Snake River Spring/Summer Chinook ESU. This population is a spring run and is listed as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) has classified this population as “Large” based on its historic habitat potential. A “Large” population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.56 recruits per spawner (R/S) to be viable.

Historically, it is estimated that from 2 to 3 million spring/summer Chinook returned to the entire Snake River each year (NPCC 2004). The portion returning to the Salmon River above Redfish Lake Creek is unknown, but was probably in the thousands. This designated independent population includes spawners in the mainstem Salmon River above Redfish Lake Creek and all tributaries to the main stem including Alturas Lake Creek.

2 Current Conditions

Adult spring/summer Chinook returns to the subbasin consist of both natural and hatchery-origin fish. With the exception of Rapid River stock, natural- and hatchery-origin Chinook in the Salmon River drainage are listed as Threatened. Spawning occurs in the mainstem Salmon River above Redfish Lake Creek, Alturas Lake Creek and other moderate sized tributaries. Spawning takes place from mid-July through late September. Juveniles leave the system as yearlings starting in early March and continuing into the spring.

Current (1962 to 2005) population abundance (number of adults spawning in natural production areas) has ranged from 18 fish in 1995 to 3,554 fish in 1978. Abundance in recent years has been highly variable. The most recent 10-year geomean number of natural spawners was 268 fish (NOAA Draft Recovery Plan). Redd counts for this population generally average fewer than 100 (1992-2003 StreamNet).

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 121 and 0.76, respectively. The model also estimates that 17 hatchery-origin spring and summer Chinook stray into this population each year.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for a Contributing population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Upper Salmon Mainstem Spring Chinook population as “Large” and identified a minimum abundance threshold of 1,000 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Large” is 1.56.

- Habitat Productivity and Capacity: Productivity: 1.8; Capacity: 2,000

2.2 Current Hatchery Programs Affecting this Population

The primary hatchery program affecting this population is the Sawtooth Hatchery Spring Chinook segregated harvest program.

This is a harvest mitigation program funded by BPA through the USFWS Lower Snake River Compensation Program. Initial program planning efforts identified production targets of 1.3 million smolts to be released in the Salmon River at the Sawtooth Fish Hatchery, 700,000 smolts released in the East Fork Salmon River, and 300,000 smolts released in Valley Creek, a tributary to the Salmon River. The Valley Creek component of the program has never been implemented. The East Fork Salmon River component was terminated in 1998. The current program production plan is to release approximately 1.4 to 1.7 million yearling smolts to the Salmon River immediately downstream of the hatchery. All adult trapping, spawning, incubation, and rearing occur at the Sawtooth Fish Hatchery. All fish are adipose fin-clipped and a portion coded wire and PIT-tagged for evaluation purposes. The average SAR and R/S for the hatchery program is 0.8% and 2.0, respectively.

The Salmon River spring Chinook broodstock was developed primarily from endemic sources. Prior to the construction of the Sawtooth Fish Hatchery in 1985, Chinook salmon smolts were periodically released in the vicinity of the present hatchery (first records from 1966). While locally returning adults were used as much as possible, juveniles were released from adults sourced at Rapid River Fish Hatchery, Hayden Creek Fish Hatchery (Lemhi River tributary), and Marion Forks Fish Hatchery (Willamette River drainage, Oregon) in 1967.

The Sawtooth Fish Hatchery has been part of The Idaho Supplementation Study (ISS). In 1991, IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study designed to continue through 2012. The project incorporates treatment and control streams in the Clearwater and Salmon subbasins. The upper Salmon River is a treatment stream for this program. “Treatments” include the development and release of “supplementation” smolts (hatchery x natural parents) and the release of “supplementation” adults to treatment spawning streams (50:50 hatchery: natural-origin release design). In 2004, juvenile treatments ended in all but three study streams. In 2007, adult treatments ended. The study will conclude in 2014 following a five-year period of “no treatment.”

Through the U.S. vs. Oregon court case, managers have agreed to plan and implement an integrated Chinook salmon supplementation program in the Upper Salmon River beginning in spawn year 2009.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 17 fish. Projected strays are produced primarily from the segregated program operating at the Sawtooth Fish Hatchery.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.9 to 1.6. Average abundance of natural-origin spawners (NOS) would increase from approximately 119 fish to approximately 715 fish. The harvest contribution of the natural and hatchery populations would go from approximately 369 fish to approximately 143 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Upper Salmon Mainstem Spring Chinook that emphasizes maintaining existing natural spawning populations as well as maintaining the current hatchery mitigation program. Currently this population is operating consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05); however, this is occurring primarily due to the low productivity of the hatchery. If hatchery productivity were to increase, it would require an ability to remove additional hatchery fish (e.g., through selective fisheries) or through the development of an integrated program to maintain the standards for a Primary population.

The LSRCP mitigation goal for this program is to return approximately 19,445 adult spring Chinook salmon to the project area upstream of Lower Granite Dam. Initial planning targets were to return 11,310 adults back to the Sawtooth Fish Hatchery, 6,090 adults back to the East Fork Salmon River, and 2,045 adults back to Valley Creek (all based on a smolt-to-adult return rate of 0.87%).

The current segregated harvest program collects broodstock from rack returns at the Sawtooth Fish Hatchery. All adult holding, spawning, incubation and rearing occur at this location. The current production target for the program is 1.4 to 1.7 million yearling smolts. Due to insufficient adult returns, this target is not consistently met. Average SAR and R/S values for hatchery-produced fish are very low (0.1% and 2.0, respectively) and currently provide relatively small harvest benefits.

The ongoing Idaho Supplementation Study is ending in 2012. Adult returns from this program ended in 2007. The current phase of the study monitors production and productivity in the absence of adult supplementation. Following 2012, managers will have greater flexibility to pursue other management options.

Chinook salmon spawning habitat for this population is located primarily upstream of the weir at the Sawtooth Fish Hatchery.

IDFG's implementation of BKD risk management strategies, including culling, has been very successful.

Recommendations

The HSRG recommends that managers implement a small (~ 200,000 smolts) integrated conservation program to support the natural population (PNI = 0.77, pHOS = 0.22, pNOB = 0.75). Broodstock for this program would initially be derived from 100% NOB, but subsequent generations would be maintained by collecting 75% NOB and 25% hatchery-origin returns from this integrated program. A separate segregated program (~ 1.2 million smolts) would be operated to address mitigation and harvest objectives. Broodstock for this program would be sourced completely from adult returns from the segregated program and would not rely on adult returns from the integrated program. However, if excess broodstock from the integrated program were available, they could be incorporated into the segregated program to maintain some genetic continuity with the naturally spawning component. Adult returns from the segregated program not needed as broodstock would need to be removed from the system or used for stream nitrification (e.g., no live fish passed upstream of the weir or returned to the population downstream of the weir).

This recommendation results in a program consistent with a "Primary" population designation. Smolts produced through the integrated program should be coded wire-

tagged but not be adipose fin-clipped. Smolts produced through the segregated program should be adipose fin-clipped.

The HSRG acknowledges that managing for the recommended PNI values may not be possible or appropriate in the near term when abundance levels are low and demographic risks to the population increase. To address this concern, managers should develop a variable sliding scale for managing abundance so that in low abundance years, more hatchery-origin fish of the appropriate population component are allowed to reach the spawning grounds to reduce demographic risk to the respective populations.

An example of such a sliding scale would look like this:

Each year, depending on NOR run size, pNOB and pHOS are allowed to “float” or slide. The HSRG assumes managers will establish an acceptable level of removal of NORs for use in the hatchery brood. This will be a fixed percentage of the total NOR return (say 40%) and will not change, regardless of NOR return. In years of high NOR abundance, this 40% could make up 100% of the needed hatchery brood (pNOB= 100%). In that case, no HORs would be used in the hatchery brood. Hatchery fish can be allowed to reach the spawning ground (pHOS) if needed to achieve an appropriate number of fish spawning naturally (demographic benefit and use of available habitat). This however, would not be required during years of very high NOR returns as both objectives (pNOB and natural spawning) may be met with NORs.

In years of low NOR abundance, the same 40% of the NOR return would be removed for use in the hatchery brood (pNOB). However, in these years, that 40% may make up only a small part of the needed brood (i.e. pNOB 10%). In these years, enough HORs should be used to achieve needed hatchery brood and additional HORs should be allowed to spawn naturally (pHOS) to achieve the minimum acceptable level of naturally spawning.

The goal of this sliding scale is to achieve an “average” PNI over time of the desired level (0.67 or 0.5) depending on the population designation even though it may not be achieved in an one year. A good way to determine the level of NORs that should be removed each year (see above) is to review the return of NORs over a long time frame and iterate what level (30, 40, 50%) are needed, on average, to achieve the desired PNI.

The HSRG also recommends that managers continue to implement their apparently successful BKD management strategies, which include culling.

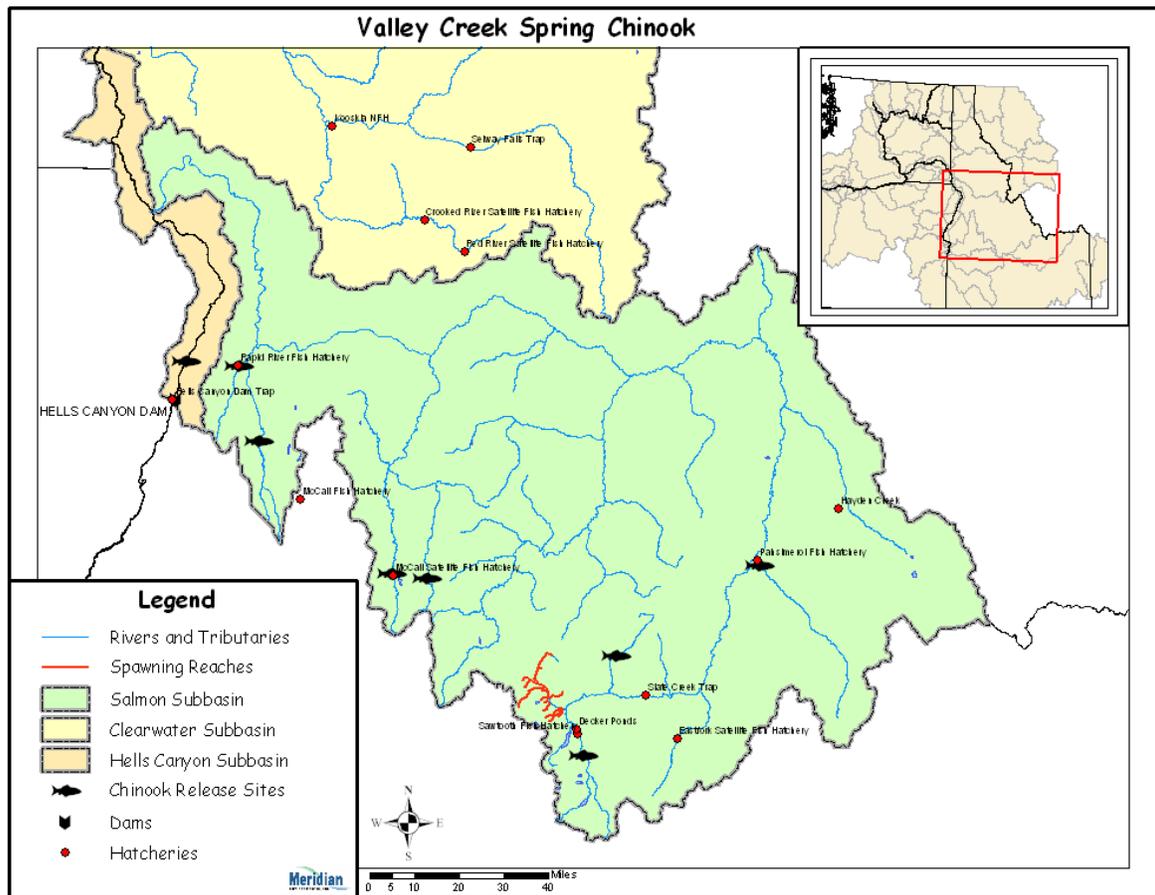
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Salmon River Spring Chinook above Redfish Lake. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 10% | 0.00 | 119 | 0.9 | 24 | 0 |
| | Seg Harv | 1,034.9 | 95% | | | | | | 345 | 335 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 715 | 1.6 | 143 | - |
| HSRG Solution | Int Cons | 197.4 | 50% | 0% | 23% | 0.76 | 619 | 1.4 | 223 | 183 |
| | Seg Harv | 1,223.0 | 95% | | | | | | 1,883 | 566 |
| HSRG Solution w/ Improved Habitat | Int Cons | 197.4 | 50% | 0% | 18% | 0.80 | 821 | 1.6 | 263 | 183 |
| | Seg Harv | 1,223.0 | 95% | | | | | | 1,883 | 566 |

Hatchery Scientific Review Group Review and Recommendations

Salmon - Valley Creek Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Salmon -Valley Creek Spring Chinook

The Valley Creek Chinook population is part of the Snake River Spring/Summer Chinook ESU. This population is characterized as a spring run adult life history type, although IDFG classifies it as containing both spring and summer runs. This population is listed as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) has classified this population as a “Basic” based on its historic habitat potential. A “Basic” population is one that requires a minimum abundance of 500 wild spawners and an intrinsic productivity greater than 2.21 recruits per spawner (R/S) to be viable.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to Valley Creek is unknown but was probably in the low thousands.

2 Current Conditions

Adult spring Chinook returns to the subbasin consist of both natural- and hatchery-origin fish. With the exception of Rapid River stock, natural- and hatchery-origin Chinook in the Salmon River drainage are listed as Threatened. Valley Creek and its tributaries support both spring and summer-run fish. Genetic samples from Valley Creek cluster closely with those from the upper Salmon River above Redfish Lake Creek. This is likely due to the influence of extensive outplanting from the Sawtooth Hatchery. The bulk of spawning in this population occurs upstream in Valley Creek, sufficiently separated from upper Salmon River spawning areas.

Current (1957 to 2003) natural population abundance (number of adults spawning in natural production areas) has ranged from 0 in 1995 to 1,496 fish in 1957. Abundance in recent years has been variable. The most recent 10-year geomean number of natural spawners was 35 fish (NOAA Draft Recovery Plan). Redd counts for Valley Creek from 1992 to 2003 generally have been less than 50 (StreamNet). AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 55 and 0.71, respectively. The model also estimates that four hatchery-origin Chinook salmon stray into this population each year.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRF assigned this population as Contributing. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Valley Creek Chinook population as “Basic” and identified a minimum abundance threshold of 500 natural-origin adult.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Basic” is 2.21.
- **Habitat Productivity and Capacity:** Productivity: 1.55; Capacity: 800

2.2 Current Hatchery Programs Affecting this Population

The IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study designed to continue through 2012. The study incorporates treatment and control streams in the Clearwater and Salmon subbasins. Valley Creek is a Control stream for this program. “Treatments” include the development and release of “supplementation” smolts (hatchery x natural parents) and the release of “supplementation” adults to treatment spawning streams (50:50 hatchery and natural-origin release design). In 2004, juvenile treatments ended in all but three ISS study streams. In 2007, adult treatments ended. The study will conclude in 2014 following a five-year period of “no treatment.”

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: four fish.

There is no Chinook salmon hatchery program operating in Valley Creek. However, AHA modeling indicates that some hatchery strays from the following programs may spawn in the Valley Creek:

- Salmon/ Little Salmon Spring Chinook (Rapid River Hatchery)
- Salmon/ East Fork/South Fork Johnson Creek Summer Chinook
- Salmon/ SF Salmon Summer Chinook (McCall Hatchery)
- Salmon/ Pahsimeroi Summer Chinook (Pahsimeroi Hatchery)
- Salmon Above Redfish Spring Chinook(Sawtooth Hatchery)

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The

solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.1 to 1.5. Average abundance of natural-origin spawners (NOS) would increase from approximately 105 fish to approximately 268 fish. The harvest contribution of the natural and hatchery populations would go from approximately 11 fish to 29 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Valley Creek Chinook salmon that emphasizes maintaining existing natural spawning populations. Currently this population is consistent with the HSRG-defined standards of a Contributing population in terms of hatchery influence (pHOS less than 0.1), although abundance levels are low.

The ongoing Idaho Supplementation Study is ending in 2012. Adult returns from this program ended in 2007. The current phase of the study monitors production and productivity in the absence of adult supplementation. Following 2012, managers will have greater flexibility to pursue other management options.

Recommendations

The HSRG recommends that managers continue to monitor status and trend information for natural populations as well as the proportion of hatchery fish in natural production areas.

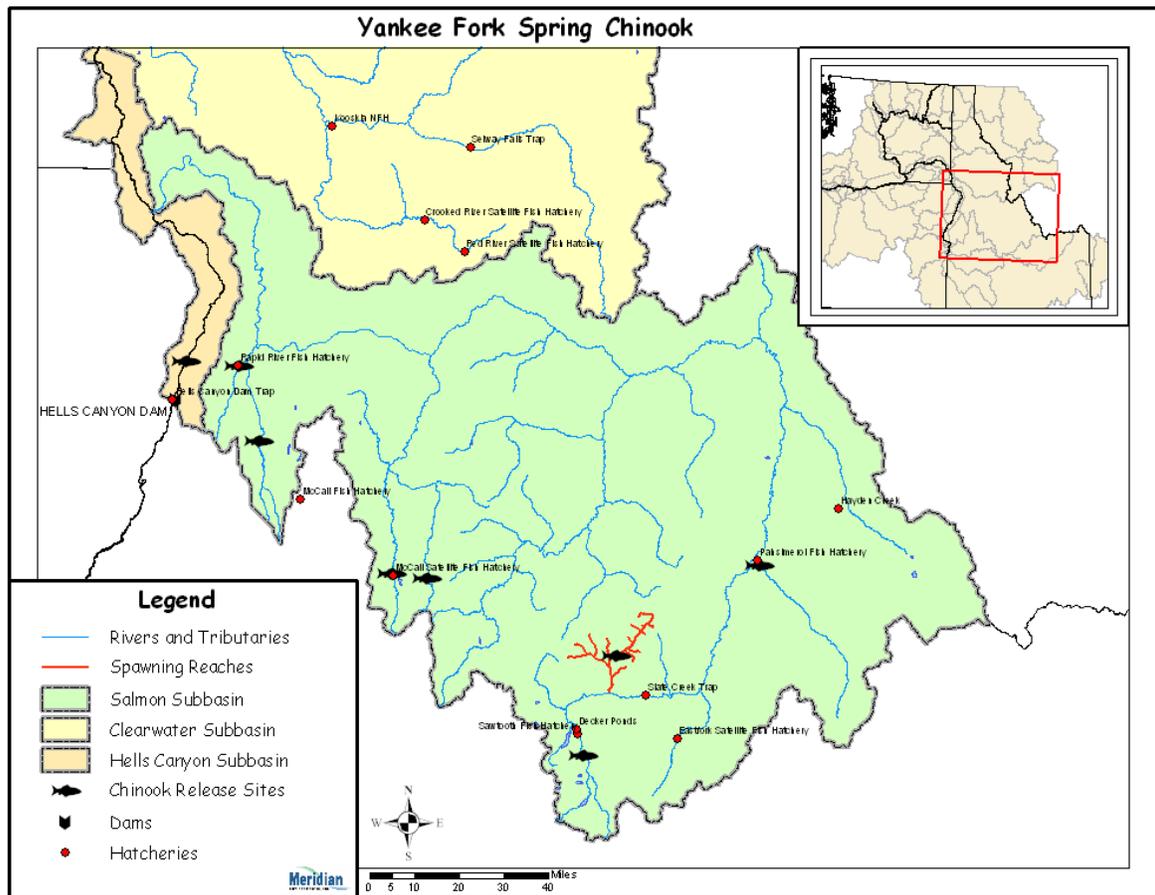
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Valley Creek Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 3% | 0.00 | 105 | 1.1 | 11 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 268 | 1.5 | 29 | - |
| HSRG Solution | None None | - | 0% | 0% | 5% | 0.00 | 95 | 1.0 | 10 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 2% | 0.00 | 272 | 1.4 | 30 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon - Yankee Fork Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Salmon Yankee Fork Spring Chinook

The Yankee Fork Chinook population is part of the Snake River Spring/Summer Chinook ESU. This spring run population is listed as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) has classified this population as “Basic” based on its historic habitat potential. A “Basic” population is one that requires a minimum abundance of 500 natural spawners and an intrinsic productivity greater than 2.21 recruits per spawner (R/S) to be viable.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPCC 2004). The portion returning to the Yankee Fork is unknown, but was probably in the thousands.

2 Current Conditions

Adult spring/summer Chinook returns to the subbasin consist of both natural- and hatchery-origin fish. With the exception of Rapid River stock, natural- and hatchery-origin Chinook in the Salmon River drainage are listed as Threatened. Currently, the Yankee Fork receives periodic introductions of juvenile and adult Chinook salmon of Sawtooth Hatchery origin. Discussions are underway between the State, NOAA, and the Shoshone-Bannock Tribes to initiate an integrated local broodstock program. Natural spawning takes place from mid-July through late September. Juveniles leave the system as yearlings starting in early March and continuing into the spring.

Since 1997, an experimental conservation hatchery program has operated in the West Fork Yankee Fork of the Salmon River, a tributary to the main Yankee Fork. This program releases maturing adult Chinook salmon to the West Fork to spawn volitionally. Adults are developed from eggs sourced from natural redds using hydraulic extraction methods. The program is currently assessing the contribution to the next generation from captive adult outplants.

Current (1961 to 2003) natural population abundance (number of adults spawning in mainstem and West Fork natural production areas) has ranged from 0 in 1995 to 1,488 fish in 1968. Abundance in recent years has been variable. The most recent 10-year geomean number of natural spawners in the mainstem and West Fork was 13 fish (NOAA Draft Recovery Plan). Redd counts collected for the West Fork Yankee Fork and mainstem Yankee Fork (1995 through 2006) have averaged 6 and 12 redds, respectively (StreamNet). AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 26 and 0.66, respectively. The model also estimates that 15 hatchery-origin Chinook stray into this population each year.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Stabilizing. The population currently meets the broodstock criteria for this population designation.

- Recovery Goal for Abundance: The ICTRT defined the Yankee Fork spring Chinook population as “Basic”, and identified a minimum abundance threshold of 500 natural-origin spawners.
- Productivity Improvement Expectation: The ICTRT productivity standard associated with a population defined as “Basic” is 2.21.
- Habitat Productivity and Capacity: Productivity: 1.45; Capacity: 600

2.2 Current Hatchery Programs Affecting this Population

While a long-term supplementation program has not been developed, releases of juvenile and/or pre-spawn adult Chinook salmon have occurred in the mainstem Yankee Fork as well as the West Fork Yankee Fork of the Salmon River. The IDFG, NOAA, and Shoshone-Bannock Tribes are discussing plans to implement a local Chinook broodstock program in the mainstem Yankee Fork Salmon River with adult trapping to experimentally begin in 2008 and spawning to begin in 2009 or after. Broodstock would be collected at a new weir in the Yankee Fork. Adults would be held streamside or at a different location. Spawning, incubation and rearing would occur at a location(s) to be named. Streamside acclimation is being discussed, but does not currently exist.

The IDFG also operates a conservation broodstock program in the West Fork Yankee Fork of the Salmon River. This program returns approximately 100 hatchery-reared Chinook salmon to natal spawning areas annually (ongoing since 1997). Fish are reared at the IDFG Eagle Fish Hatchery through smoltification then transferred to NOAA’s Manchester Marine Lab for rearing on seawater through maturation. The IDFG is currently assessing whether successful next generation production occurs from the release of pre-spawn adults.

In 1991, IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study designed to continue through 2012. The study incorporates treatment and control streams in the Clearwater and Salmon subbasins. The West Fork Yankee Fork of the Salmon River is a treatment stream for this program. “Treatments” include the development and release of “supplementation” smolts (hatchery x natural parents) and the release of “supplementation” adults to treatment spawning streams (50:50 hatchery and natural-origin release design). In 2004, juvenile treatments ended in all but three ISS study streams. In 2007, adult treatments ended. The study will conclude in 2014 following a five-year period of “no treatment.”

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 15 fish. Potential strays are produced primarily from the segregated program operating at the Sawtooth Fish Hatchery.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary,

the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.7 to 1.4. Average abundance of natural-origin spawners (NOS) would increase from approximately 26 fish to approximately 171 fish. The harvest contribution of the natural and hatchery populations would go from approximately three fish to 19 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Yankee Fork Spring Chinook that emphasizes maintaining existing natural spawning populations as well as using hatchery-origin Chinook salmon in an attempt to augment natural production. Currently this population

is not consistent with the HSRG-defined standards for either a Primary or Contributing population (pHOS greater than 0.1).

Currently, no hatchery program operates in the mainstem Yankee Fork Salmon River; however, occasional releases of pre-spawn adults as well as smolts have occurred. Beginning in 2009, the IDFG, NOAA, and Shoshone-Bannock Tribes anticipate the start-up of a localized broodstock program in the mainstem Yankee Fork. Adults would be collected at a new weir site on the mainstem. Broodstock management plans have not been finalized but the intent is to maintain as high a pNOB value as possible. Natural- and hatchery-origin adults would comprise the natural spawning component (composition to be determined). All spawning, incubation and juvenile rearing would occur at a location(s) to be named. Full-term smolts would be released directly to the Yankee Fork or acclimated in yet to be constructed stream side ponds. Program size is under discussion.

The IDFG also operates a conservation hatchery program in the West Fork Yankee Fork Salmon River. Ongoing since 1997, this program sources eggs from natural redds. Fish are reared at the IDFG Eagle Fish Hatchery through smoltification, then transferred to NOAA's Manchester Research Station for rearing on seawater through maturation. Adults are trucked back to natal waters and released for natural spawning. The last release of adults in the Yankee Fork will be in 2009. IDFG is currently assessing the production potential of this conservation strategy.

The ongoing Idaho Supplementation Study is ending in 2012. Adult returns from this program ended in 2007. The current phase of the study monitors production and productivity in the absence of adult supplementation. Following 2012, managers will have greater flexibility to pursue other management options.

Recommendations

The HSRG recommends that managers continue to monitor status and trend information for this natural population as well as the proportion of hatchery fish in natural production areas.

As planning progresses on developing a locally adapted, integrated Yankee Fork Chinook salmon program, managers should consider adopting a sliding scale broodstock/escapement management strategy.

The HSRG acknowledges that managing for the recommended PNI values may not be possible or appropriate in the near term when abundance levels are low and demographic risks to the population increase. To address this concern, managers should develop a variable sliding scale for managing abundance so that in low abundance years, more hatchery-origin fish of the appropriate population component are allowed to reach the spawning grounds to reduce demographic risk to the respective populations.

An example of such a sliding scale would look like this:

Each year, depending on NOR run size, pNOB and pHOS are allowed to "float" or slide. The HSRG assumes managers will establish an acceptable level of removal of NORs for use in the hatchery brood. This will be a fixed percentage of the total NOR return (say 40%) and will not change, regardless of NOR return. In years of high NOR abundance, this 40% could make up 100% of the needed hatchery brood (pNOB= 100%). In that case, no HORs would be used in the hatchery brood. Hatchery fish can be allowed to reach the spawning ground (pHOS) if needed to achieve an appropriate number of fish spawning naturally (demographic benefit and use of available habitat). This however,

would not be required during years of very high NOR returns as both objectives (pNOB and natural spawning) may be met with NORs.

In years of low NOR abundance, the same 40% of the NOR return would be removed for use in the hatchery brood (pNOB). However, in these years, that 40% may make up only a small part of the needed brood (i.e. pNOB 10%). In these years, enough HORs should be used to achieve needed hatchery brood and additional HORs should be allowed to spawn naturally (pHOS) to achieve the minimum acceptable level of naturally spawning.

The goal of this sliding scale is to achieve an “average” PNI over time of the desired level (0.67 or 0.5) depending on the population designation even though it may not be achieved in an one year. A good way to determine the level of NORs that should be removed each year (see above) is to review the return of NORs over a long time frame and iterate what level (30, 40, 50%) are needed, on average, to achieve the desired PNI.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

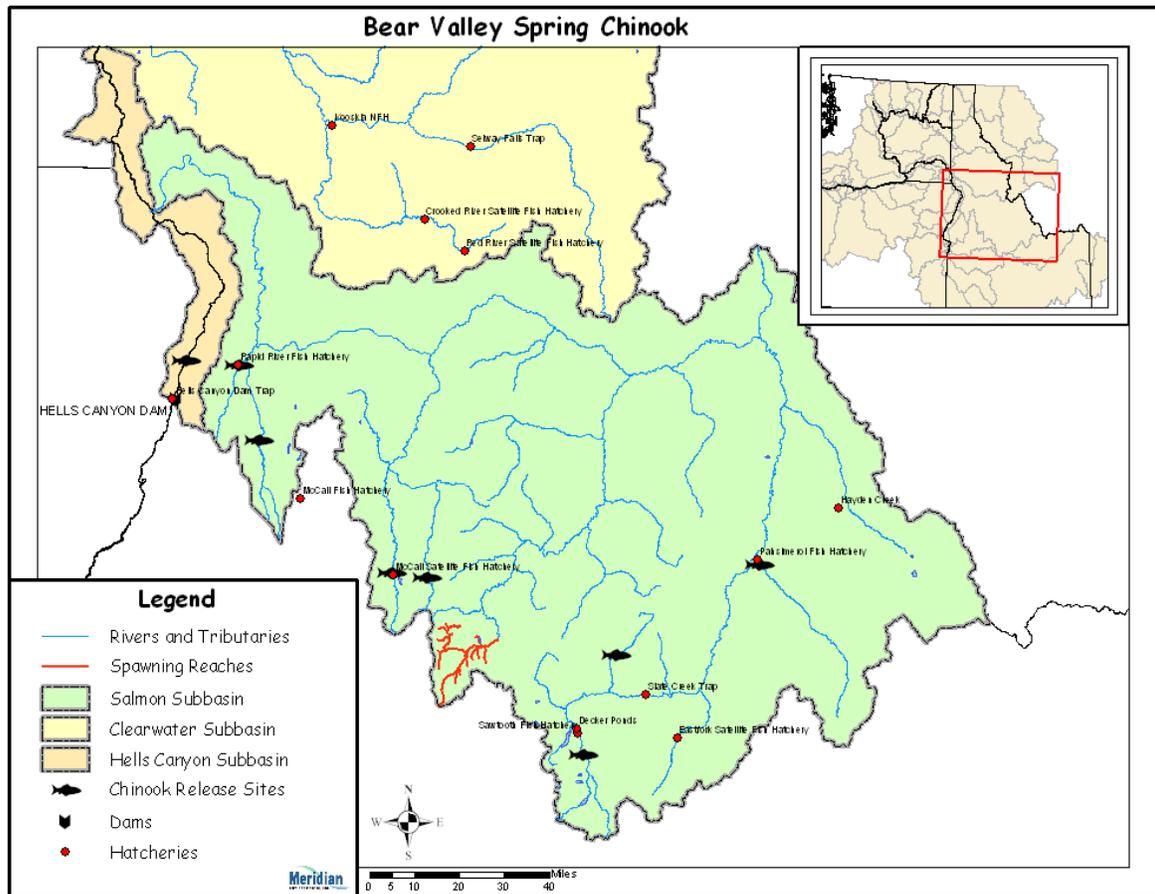
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Yankee Fork Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 31% | 0.00 | 26 | 0.7 | 3 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 171 | 1.4 | 19 | - |
| HSRG Solution | None None | - | 0% | 0% | 29% | 0.00 | 32 | 0.7 | 4 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 22% | 0.00 | 45 | 0.8 | 5 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon - Bear Valley Creek Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Salmon Bear Valley Creek Spring/Summer Chinook

This population is considered part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) listed this population as “Intermediate” based on its historic habitat potential. An “Intermediate” population is one that requires a minimum abundance of 750 natural spawners and an intrinsic productivity greater than 1.76 recruits per spawner (R/S) to be viable.

Historically, it is estimated that anywhere from 2 to 3 million spring/summer Chinook returned to the entire Snake River each year (NPCC 2004). The portion returning to Bear Valley Creek is unknown, but was probably in the thousands.

2 Current Conditions

Adult spring/summer Chinook returns to the subbasin consist of natural-origin fish only. No hatchery strays have been found during spawning surveys for this population. The natural-origin population is listed as Threatened. Spawning occurs from mid-July through late October in Bear Valley Creek, Elk Creek, Cache Creek and some smaller tributaries of these systems. Stream habitat quality is high as evidenced by the fact that this area supports some of the strongest bull trout populations in the Northwest (NPCC 2004). However, past mining activities have increased fine sediment levels in the stream.

Current (1960 to 2003) natural population abundance (number of adults spawning in natural production areas) has ranged from fewer than 16 fish in 1995 to 1,853 fish in 1962. Abundance in recent years has been highly variable. The most recent 10-year geomean number of natural spawners was 188 fish (NOAA Draft Recovery Plan). Redd count data for Bear Valley Creek from 1995-2002 ranged from 50-600 (StreamNet).

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 793 and 2.29, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Bear Valley Creek Chinook population as “Intermediate” and identified a minimum abundance threshold of 750 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Intermediate” is 1.76.
- **Habitat Productivity and Capacity:** Productivity: 2.5; Capacity: 1,400

2.2 Current Hatchery Programs Affecting this Population

There is no Chinook salmon hatchery program operating in the Middle Fork Salmon River drainage.

The IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study that will continue through 2012. The study incorporates treatment and control streams in the Clearwater and Salmon subbasins. Bear Valley Creek is a Control stream for this program. “Treatments” include the development and release of “supplementation” smolts (hatchery x natural parents) and the release of “supplementation” adults to treatment spawning streams (50:50 hatchery: natural-origin release design). In 2004, juvenile treatments ended in all but three study streams. In 2007, adult treatments ended. The study will conclude in 2014 following a five-year period of “no treatment” evaluation.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 0

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would go from 2.3 to 2.4. Average abundance of natural-origin spawners (NOS) would go from 793 fish to 869 fish. The harvest contribution of the natural population would go from approximately 87 fish to 95 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Bear Valley Creek Chinook salmon that emphasizes maintaining existing natural spawning populations. Currently this population is consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

There are no releases of hatchery-origin Chinook salmon within the Middle Fork Salmon River Major Population Group.

Recommendations

The HSRG recommends that managers continue to monitor status and trend information for natural populations of Chinook salmon in Bear Valley Creek as well as monitor presence/absence and the proportion of hatchery fish in natural production areas.

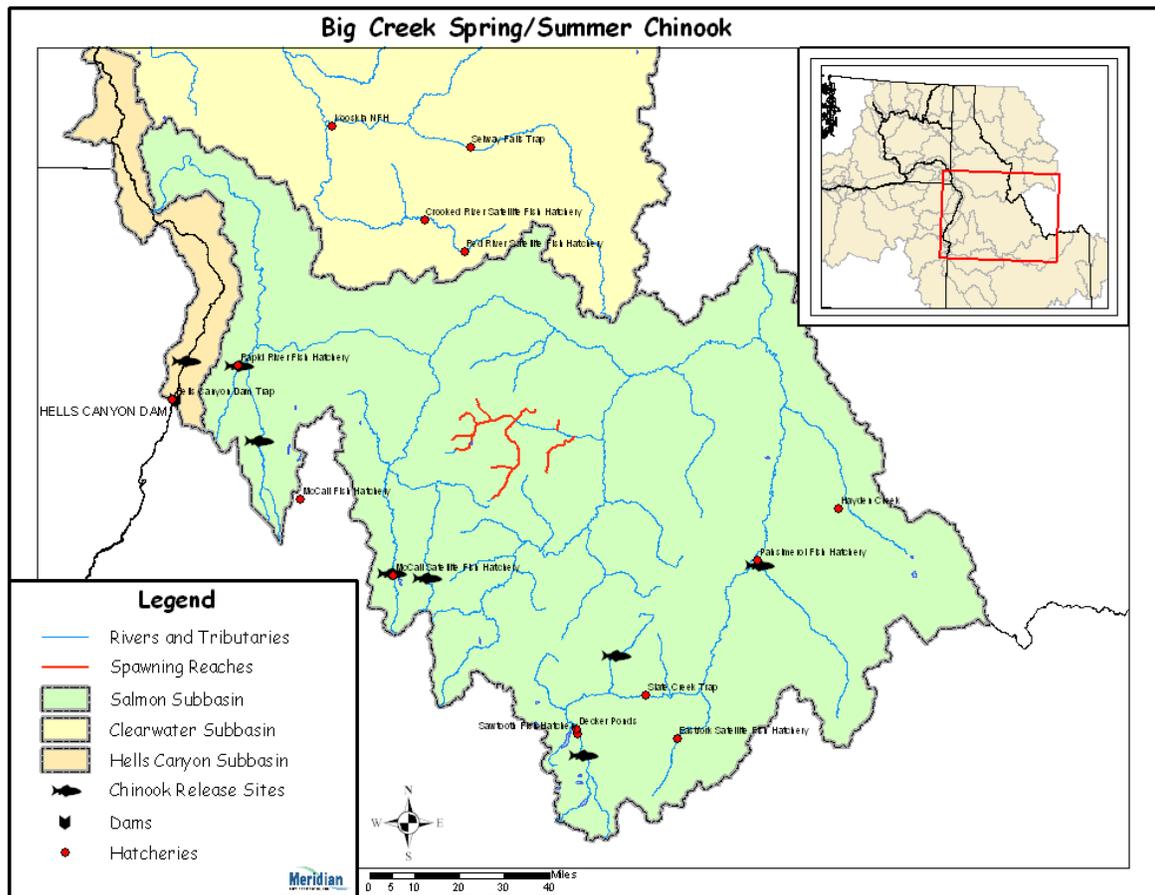
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Bear Valley Creek Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 793 | 2.3 | 87 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 869 | 2.4 | 95 | - |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 868 | 2.4 | 95 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 1,020 | 2.6 | 111 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon Big Creek Spring/Summer Chinook Population and Related Hatchery Programs

January 31, 2009



1 Salmon Big Creek Spring/Summer Chinook

This population is considered part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) listed this population as “Large” based on its historic habitat potential. A “Large” population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.56 recruits per spawner (R/S) to be viable.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to Big Creek is unknown but was probably in the thousands.

2 Current Conditions

Adult spring/summer Chinook returns to the subbasin consist of natural-origin adults and possibly a few hatchery strays from outside the population. Both natural- and hatchery-origin components of this population (except strays from Rapid River Hatchery) are listed as Threatened. Spawning occurs from mid-July through late October in Big Creek and Monumental Creek. Juveniles emigrate from the system in the spring as yearlings. Hatchery fish have not been released to the subbasin. To date, no hatchery-origin adults have been collected during spawning surveys, although data is limited.

Current (1957 to 2004) abundance (number of adults spawning in natural production areas) has ranged from 5 fish in 1996 to 1,858 fish in 1961. Abundance in recent years has been moderately variable. The most recent 10-year geometric mean number of natural-origin spawners was 94 fish (NOAA Draft Recovery Plan).

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 468 and 1.40, respectively. Habitat in the stream is considered high quality with little impact from human development.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Big Creek Chinook population as “Large” and identified a minimum abundance threshold of 1,000 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Large” is 1.56.
- **Habitat Productivity and Capacity:** Productivity: 1.6; Capacity: 1,700

2.2 Current Hatchery Programs Affecting this Population

There is no hatchery stock associated with this Chinook population. However, IDFG operates a screw trap in Big Creek and AHA modeling indicates that some hatchery strays from the following programs have the potential to spawn in Big Creek:

- Salmon/ Little Salmon Spring Chinook (Rapid River Hatchery)
- Salmon/ East Fork/South Fork Johnson Creek Summer Chinook
- Salmon/ South Fork Salmon Summer Chinook (McCall Hatchery)
- Salmon/ Pahsimeroi Summer Chinook (Pahsimeroi Hatchery)

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: four fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.4 to 1.5. Average abundance of natural-origin spawners (NOS) would increase from approximately 467 fish to approximately 610 fish. The harvest contribution of the natural and hatchery populations would go from approximately 51 fish to approximately 67 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

| |
|--|
| <p>Observations</p> <p>Managers have identified a strategy Big Creek Chinook salmon that emphasizes maintaining existing natural spawning populations. Currently this population is consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).</p> <p>There are no releases of hatchery-origin Chinook salmon within the Middle Fork Salmon River Major Population Group. The proximity of this population to the mainstem migration corridor suggests there may be a higher number of hatchery strays to this population than other Middle Fork Salmon River populations.</p> <p>Recommendations</p> <p>The HSRG recommends that managers continue to monitor status and trend information for natural populations of Chinook salmon in Big Creek as well as monitor presence/absence and the proportion of hatchery fish in natural production areas.</p> |
|--|

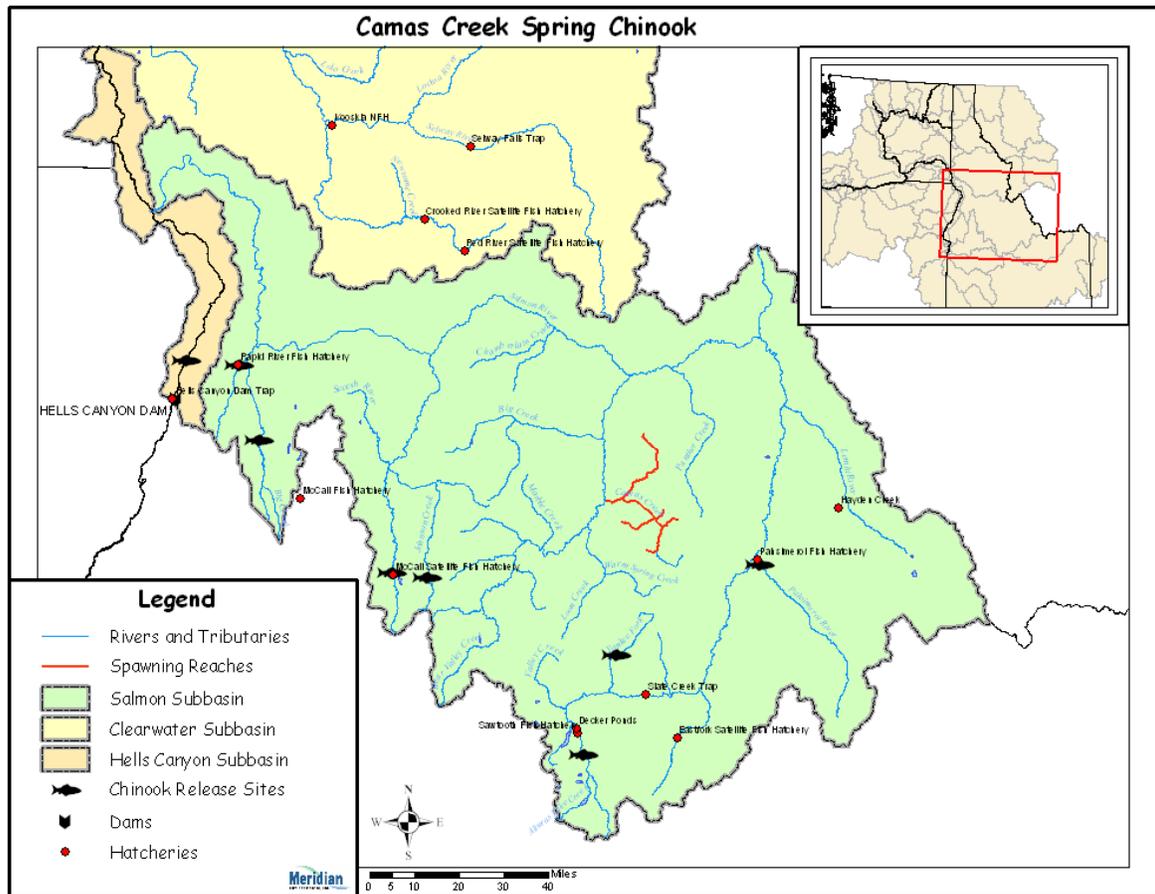
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Big Creek Spring/Summer Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 467 | 1.4 | 51 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 610 | 1.5 | 67 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 528 | 1.4 | 58 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 743 | 1.6 | 81 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon-Camas Creek Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Salmon Camas Creek Spring Chinook

This population is considered part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) listed this population as a “Basic” based on its historic habitat potential. A “Basic” population is one that requires a minimum abundance of 500 natural spawners and an intrinsic productivity greater than 2.21 recruits per spawner (R/S) to be viable.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to Camas Creek is unknown, but was likely in the low thousands.

2 Current Conditions

Adult spring/summer Chinook returns to the subbasin consist of natural-origin fish only. The population includes all Chinook spawning in Camas Creek and its tributaries. The natural-origin population is listed as Threatened. Spawning occurs in Camas Creek upstream of Hammer Creek and the South Fork from mid-July through late September. Juveniles leave the system as yearlings starting in early March and continuing into spring.

Current (1963 to 2004) abundance (number of adult spawning in natural production areas) has ranged from 0 in 1995 to 506 in 1964. Abundance in recent years has been highly variable. The most recent 10-year geomean number of natural spawners was 29 fish (NOAA Draft Recovery Plan).

AHA modeling data submitted by IDFG estimate current adult escapement and adjusted productivity for the natural-origin population at 63 and 1.12, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Camas Creek Chinook population as “Basic” and identified a minimum abundance threshold of 500 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Basic” is 2.21.
- **Habitat Productivity and Capacity:** Productivity: 1.25; Capacity: 750

2.2 Current Hatchery Programs Affecting this Population

There is no Chinook salmon hatchery program operating in the Middle Fork Salmon River drainage.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 0

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would go from 1.1 to 1.2. Average abundance of natural-origin spawners (NOS) would increase from approximately 62 fish to approximately 121 fish. The harvest contribution of the natural population would go from approximately seven fish to 13 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager’s goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Camas Creek Chinook salmon that emphasizes maintaining existing natural spawning populations. Currently this population is consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

There are no releases of hatchery-origin Chinook salmon within the Middle Fork Salmon River Major Population Group.

Recommendations

The HSRG recommends that managers continue to monitor status and trend information for natural populations of Chinook salmon in Camas Creek as well as monitor presence/absence and the proportion of hatchery fish in natural production areas.

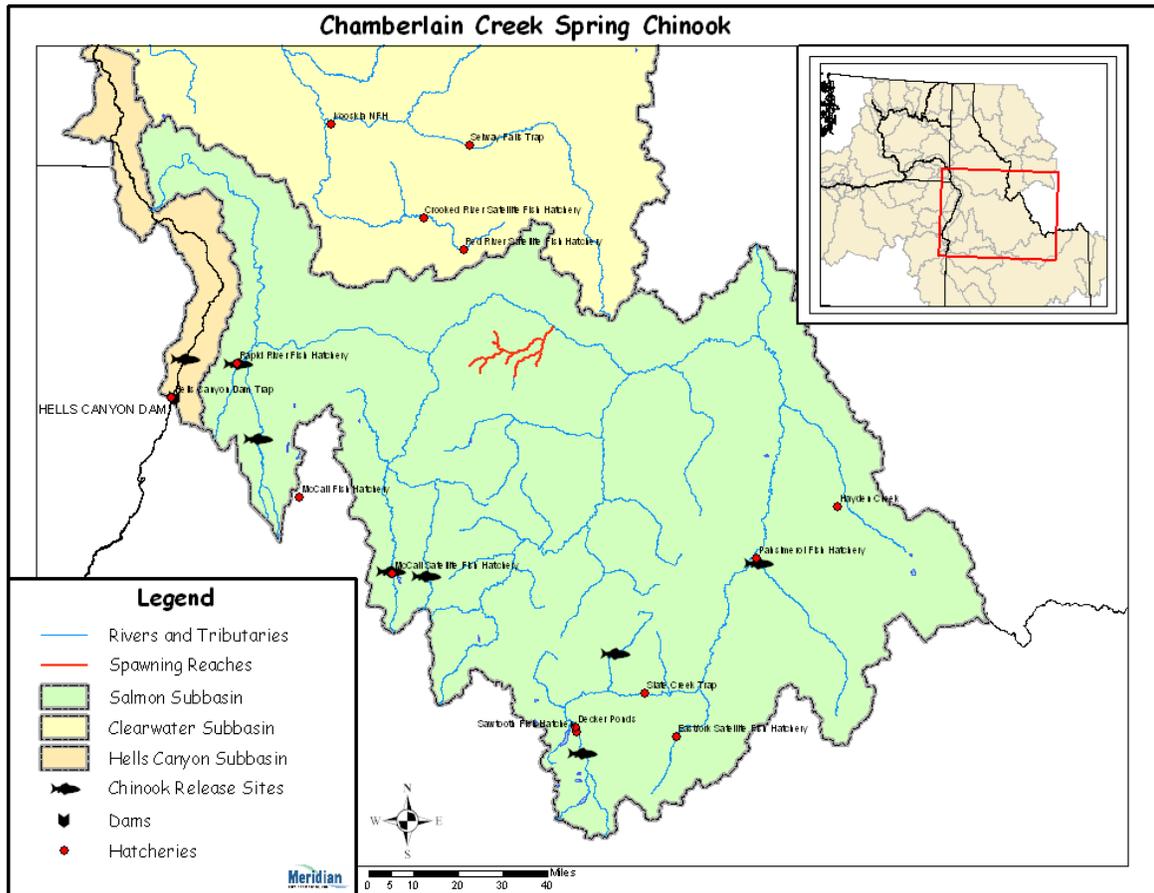
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Camas Creek Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 62 | 1.1 | 7 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 121 | 1.2 | 13 | - |
| | | | | | | | | | | |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 103 | 1.2 | 11 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 193 | 1.3 | 21 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon Chamberlain Creek Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Salmon Chamberlain Creek Spring Chinook

This population is considered part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Review Team (ICTRT) listed this population as “Intermediate” based on its historic habitat potential. However, the ICTRT noted that this population may better align with the criteria for a “Basic” population. A “Basic” population is one that requires a minimum abundance of 500 natural spawners and an intrinsic productivity greater than 2.21 recruits per spawner (R/S) to be viable.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to Chamberlain Creek is unknown, but was probably in the thousands.

2 Current Conditions

Adult spring/summer Chinook returns to the subbasin consist of both natural-origin fish and a few hatchery strays from outside the population. Both natural- and hatchery-origin (except strays from Rapid River Hatchery) components of this population are listed as Threatened. Spawning occurs from mid-July through late September. Hatchery Chinook salmon have not been outplanted in the Middle Salmon-Chamberlain Creek watershed.

Current (1985 to 2003) natural population abundance (number of adult spawning in natural production areas) has ranged from 13 fish in 1998 to 686 fish in 2003.

Abundance in recent years has been highly variable. The most recent 10-year geometric number of natural spawners was 223 fish (NOAA Draft Recovery Plan). Chinook salmon parr densities for Chamberlain Creek have been estimated at less than 5% of the stream’s potential carrying capacity (NPPC 2004).

AHA modeling data submitted by IDFG estimate current adult escapement and adjusted productivity for this population at 421 and 1.74, respectively. The habitat in Chamberlain Creek has been managed as wilderness since the 1930s. The area is free of major water diversions, roads or human-induced pollution (NPPC 2004).

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Chamberlain Creek Spring Chinook population as “Intermediate/Basic” and identified a minimum abundance threshold of 500 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Basic” is 2.21.
- **Habitat Productivity and Capacity:** Productivity: 2.0; Capacity: 1,000

2.2 Current Hatchery Programs Affecting this Population

There is no hatchery stock associated with this Chinook population; however, AHA modeling indicates that some hatchery strays from the following programs may spawn in Chamberlain Creek:

- Salmon/ Little Salmon Spring Chinook (Rapid River Hatchery)
- Salmon/ East Fork/South Fork Johnson Creek Summer Chinook
- Salmon/ South Fork Salmon Summer Chinook (McCall Hatchery)
- Salmon/ Pahsimeroi Summer Chinook (Pahsimeroi Hatchery)

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: four fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.7 to 1.9. Average abundance of natural-origin spawners (NOS) would increase from approximately 420 fish to approximately 504 fish. The harvest contribution of the natural and hatchery populations would go from approximately 46 fish to approximately 55 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Chamberlain Creek Chinook salmon that emphasizes maintaining existing natural spawning populations. Currently this population is consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

There are no releases of hatchery-origin Chinook salmon within the Middle Fork Salmon River Major Population Group. The proximity of this population to the mainstem migration corridor suggests there may be a higher number of hatchery strays to this population than other Middle Fork Salmon River populations.

Recommendations

The HSRG recommends that managers continue to monitor status and trend information for natural populations of Chinook salmon in Chamberlain Creek as well as monitor presence/absence and the proportion of hatchery fish in natural production areas.

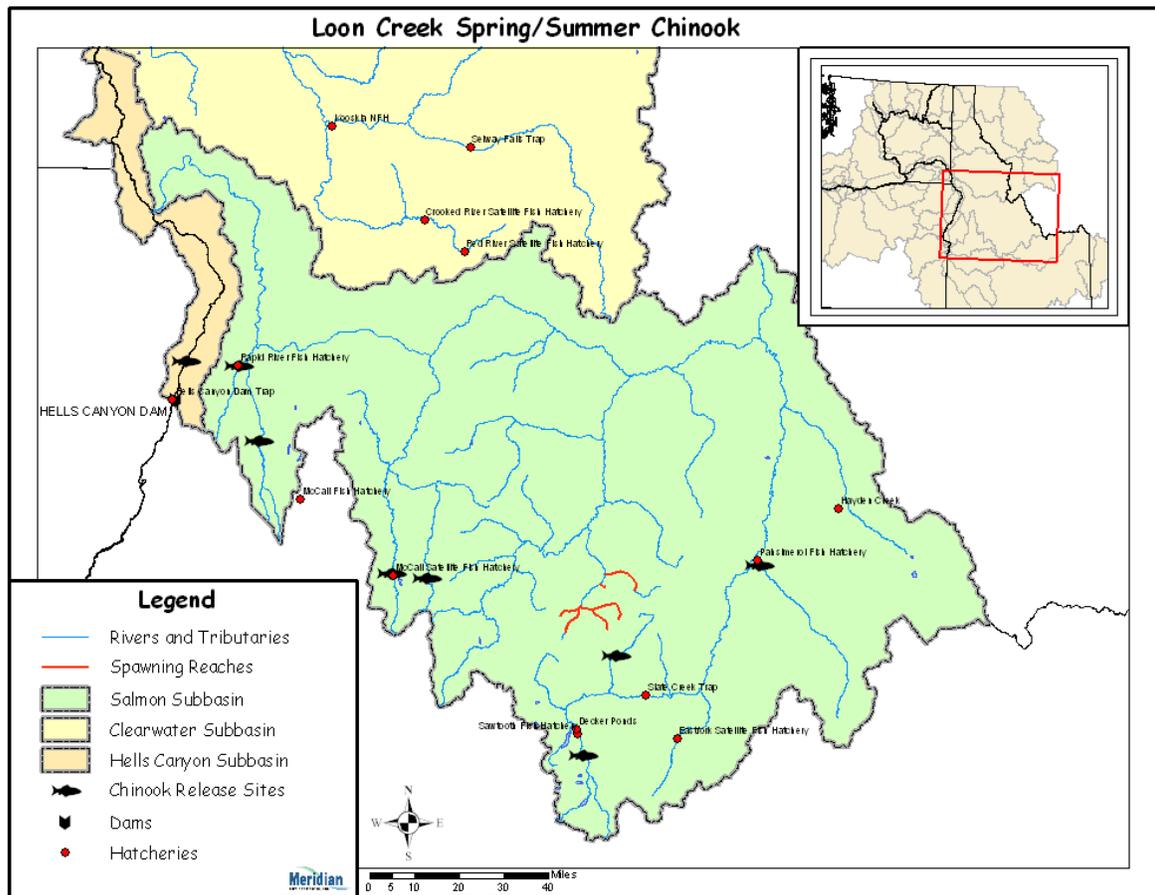
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Chamberlain Creek Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 420 | 1.7 | 46 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 504 | 1.9 | 55 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 461 | 1.8 | 50 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 581 | 2.0 | 63 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon - Loon Creek Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Salmon Loon Creek Spring Chinook

This population is considered part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) listed this population as “Basic” based on its historic habitat potential. A “Basic” population is one that requires a minimum abundance of 500 natural spawners and an intrinsic productivity greater than 2.21 recruits per spawner (R/S) to be viable.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to Loon Creek is unknown, but was likely in the low thousands.

2 Current Conditions

Adult spring/summer Chinook returns to the subbasin consist of natural-origin fish only. The natural-origin population is listed as Threatened. Spawning occurs in Loon Creek upstream of Cold Springs Creek and Warm Springs and Mayfield creeks. Spawn timing is from mid-July through late September. Juveniles leave the system as yearlings starting in early March with migration continuing into the spring.

Current (1953 to 2002) abundance (number of adults spawning in natural production areas) has ranged from 0 fish (1979, 1990, and 1995) to 1,058 fish in 1957. Abundance in recent years has been highly variable. The most recent 10-year geometric number of natural spawners was 51 fish (NOAA Draft Recovery Plan). Redd counts for Loon Creek were generally less than 50 from 1995 to 2002 (StreamNet).

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 105 and 1.18, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Loon Creek Chinook population as “Basic” and identified a minimum abundance threshold of 500 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Basic” is 2.21.
- **Habitat Productivity and Capacity:** Productivity: 1.3; Capacity: 800

2.2 Current Hatchery Programs Affecting this Population

There is no Chinook salmon hatchery program operating in the Middle Fork Salmon River drainage.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 0 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would be unchanged 1.2. Average abundance of natural-origin spawners (NOS) would increase from approximately 105 fish to approximately 156 fish. The harvest contribution of the natural population would go from approximately 11 fish to 17 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager’s goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Loon Creek Chinook salmon that emphasizes maintaining existing natural spawning populations. Currently this population is consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

There are no releases of hatchery-origin Chinook salmon within the Middle Fork Salmon River Major Population Group.

Recommendations

The HSRG recommends that managers continue to monitor status and trend information for natural populations of Chinook salmon in Loon Creek as well as monitor presence/absence and the proportion of hatchery fish in natural production areas.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Loon Creek Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 105 | 1.2 | 11 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 156 | 1.2 | 17 | - |
| | | | | | | | | | | |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 145 | 1.2 | 16 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 236 | 1.4 | 26 | 0 |
| | | | | | | | | | | |

1 Salmon Marsh Creek Spring Chinook

This population is considered part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) listed this population as “Basic” based on its historic habitat potential. A “Basic” population is one that requires a minimum abundance of 500 natural spawners and an intrinsic productivity greater than 2.21 recruits per spawner (R/S) to be viable.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to Marsh Creek is unknown, but was probably in the low thousands.

2 Current Conditions

Adult spring/summer Chinook returns to the subbasin consist of natural-origin fish only. No hatchery strays have been found during spawning surveys for this population. The natural-origin population is listed as Threatened. Portions of Marsh Creek have been degraded by past land use activities such as mining, grazing and logging, which have reduced Chinook abundance. Spawning takes place in Marsh Creek from mid-July through late September. Juveniles emigrate from the system as yearlings in the spring of the year.

From 1957 to 2003, natural population abundance (number of adults spawning in natural production areas) has ranged from fewer than 5 fish in 1995 and 1999 to 1,104 fish in 1967. Abundance in recent years has been highly variable. The most recent 10-year geomean number of natural spawners was 41 fish. Redd counts in Marsh Creek have generally been less than 100 from 1995-2002 (StreamNet); however, redd counts exceeded 200 in 2001 and 2002.

AHA modeling data submitted by IDFG estimate current adult escapement and adjusted productivity for the natural-origin population at 82 and 1.17, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Marsh Creek Chinook population as “Basic” and identified a minimum abundance threshold of 500 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Basic” is 2.21.
- **Habitat Productivity and Capacity:** Productivity: 1.3; Capacity: 650

2.2 Current Hatchery Programs Affecting this Population

There is no Chinook salmon hatchery program operating in the Middle Fork Salmon River drainage.

The IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study that will continue through 2012. The project incorporates treatment and control streams in the Clearwater and Salmon subbasins. Marsh Creek is a Control stream for this program. “Treatments” include the development and release of “supplementation” smolts (hatchery x natural parents) and the release of “supplementation” adults to treatment spawning streams (50:50 hatchery: natural-origin release design). In 2004, juvenile treatments ended in all but three study streams. In 2007, adult treatments ended. IDFG operates a screw trap on Marsh Creek as part of the ISS program. The study will conclude in 2014 following a five-year period of “no treatment” evaluation.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 0 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008). Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain unchanged at 1.2. Average abundance of natural-origin spawners (NOS) would increase from approximately 82 fish to approximately 127 fish. The harvest contribution of the natural population would go from approximately nine fish to 14 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

| |
|---|
| <p>Observations</p> <p>Managers have identified a strategy for Marsh Creek Chinook salmon that emphasizes maintaining existing natural spawning populations. Currently this population is consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).</p> <p>There are no releases of hatchery-origin Chinook salmon within the Middle Fork Salmon River Major Population Group.</p> <p>Recommendations</p> <p>The HSRG recommends that managers continue to monitor status and trend information for natural populations of Chinook salmon in Marsh Creek as well as monitor presence/absence and the proportion of hatchery fish in natural production areas.</p> |
|---|

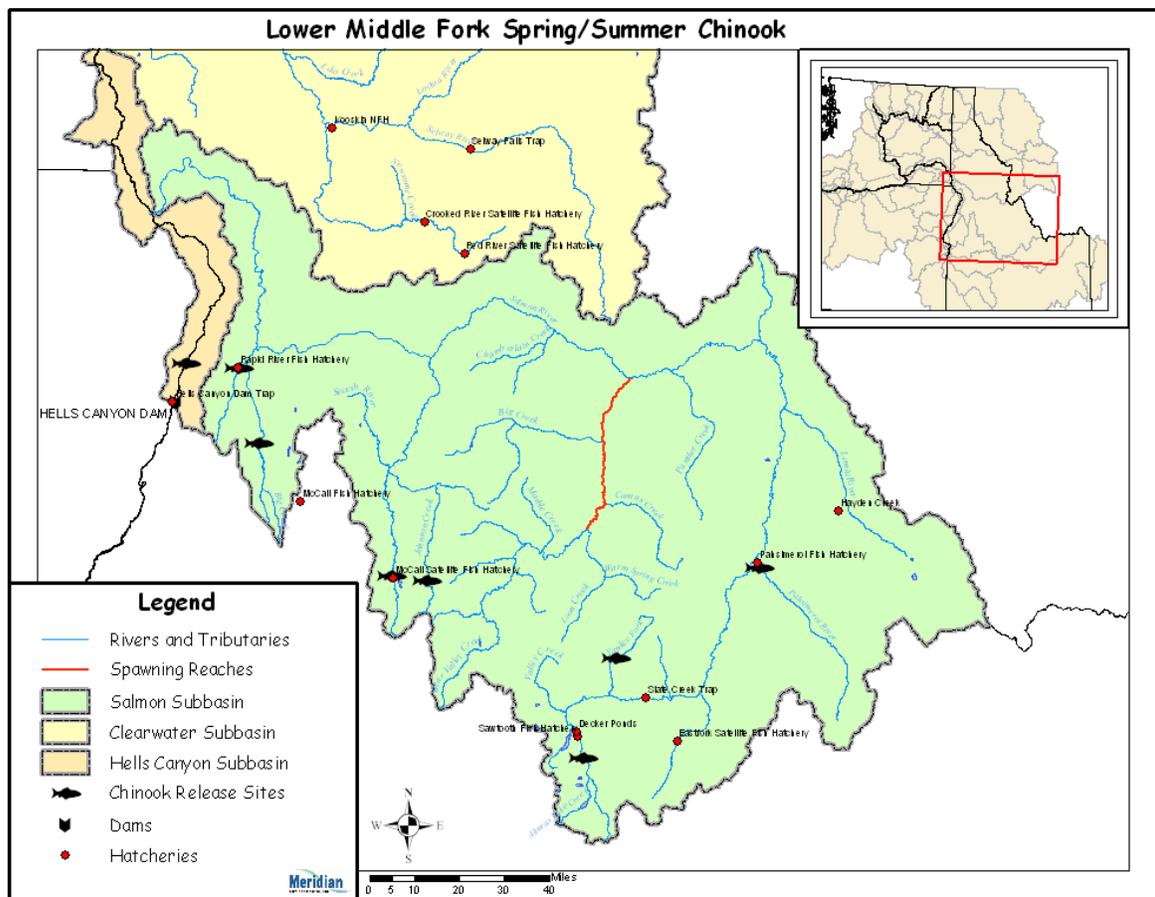
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Marsh Creek Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 82 | 1.2 | 9 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 127 | 1.2 | 14 | - |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 114 | 1.2 | 12 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 190 | 1.4 | 21 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Middle Fork Salmon Lower Mainstem Spring/Summer Chinook Population and Related Hatchery Programs

January 31, 2009



1 Middle Fork Salmon Lower Mainstem Spring/Summer Chinook

This population is considered part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) listed this population as a “Basic” based on its historic habitat potential. A “Basic” population is one that requires a minimum abundance of 500 natural spawners and an intrinsic productivity greater than 2.21 recruits per spawner (R/S) to be viable.

This population consists of the mainstem Middle Fork Salmon River and tributaries between Indian Creek and Big Creek. Spawning is primarily restricted to the mainstem Middle Fork Salmon River within the population boundary. Tributaries to the mainstem within this reach typically are small and high gradient. The largest tributary, Horse Creek (which is a tributary of the mainstem Salmon River), supports most of the recently documented spawning in the population.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to the Middle Fork Salmon Lower Mainstem is unknown but was likely in the low thousands.

2 Current Conditions

Adult spring/summer Chinook returns to the subbasin consist of natural-origin fish and possibly a few hatchery fish. The population includes all Chinook spawning in the Middle Fork between Indian Creek and Big Creek, and within Horse Creek. Both natural- and hatchery-origin components of this population (except strays from Rapid River Hatchery) are listed as Threatened. Spawning occurs from mid-July through late October. Juveniles leave the system as yearlings starting in early March with migration continuing into spring.

Current population abundance (number of adults spawning in natural production areas) is unknown. Fewer than 50 redds were counted in the Middle Fork Mainstem Salmon River from 1995-2002 (these data were not broken out for upper and lower mainstem areas) (NPCC 2004). From 1989 through 2006, an average of three redds were counted in the mainstem area between the mouth of the Middle Fork Salmon River and the confluence of Loon Creek (StreamNet).

AHA modeling data submitted by IDFG estimate current adult escapement and adjusted productivity for the natural-origin population at nine and 0.69, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Contributing. The population currently meets the broodstock criteria for a Primary population designation.

- Recovery Goal for Abundance: The ICTRT defined the Lower Mainstem Middle Fork Salmon River Chinook population as “Basic” and identified a minimum abundance threshold of 500 natural-origin adults.
- Productivity Improvement Expectation: The ICTRT productivity standard associated with a population defined as “Basic” is 2.21.
- Habitat Productivity and Capacity: Productivity: 1.50; Capacity: 1,000

2.2 Current Hatchery Programs Affecting this Population

No hatchery programs are present in this area; however, AHA modeling indicates that some hatchery strays from the following programs have the potential to spawn in this portion of the subbasin:

- Salmon/ Little Salmon Spring Chinook (Rapid River Hatchery)
- Salmon/ East Fork/South Fork Johnson Creek Summer Chinook
- Salmon/ South Fork Salmon Summer Chinook (McCall Hatchery)
- Salmon/ Pahsimeroi Summer Chinook (Pahsimeroi Hatchery)

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: four fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.9 to 1.4. Average abundance of natural-origin spawners (NOS) would increase from approximately 63 fish to approximately 311 fish. The harvest contribution of the natural and hatchery populations would go from approximately seven fish to approximately 34 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Lower Mainstem Middle Fork Salmon River Chinook salmon that emphasizes maintaining existing natural spawning populations. Currently this population is consistent with the HSRG-defined standards of a Contributing population (pHOS less than 0.1).

There are no releases of hatchery-origin Chinook salmon within the Middle Fork Salmon River Major Population Group. The proximity of this population to the mainstem migration corridor suggests there may be a higher number of hatchery strays to this population than other Middle Fork Salmon River populations.

Recommendations

The HSRG recommends that managers continue to monitor status and trend information for natural populations of Chinook salmon in the Lower Mainstem Middle Fork Salmon River as well as monitor presence/absence and the proportion of hatchery fish in natural production areas.

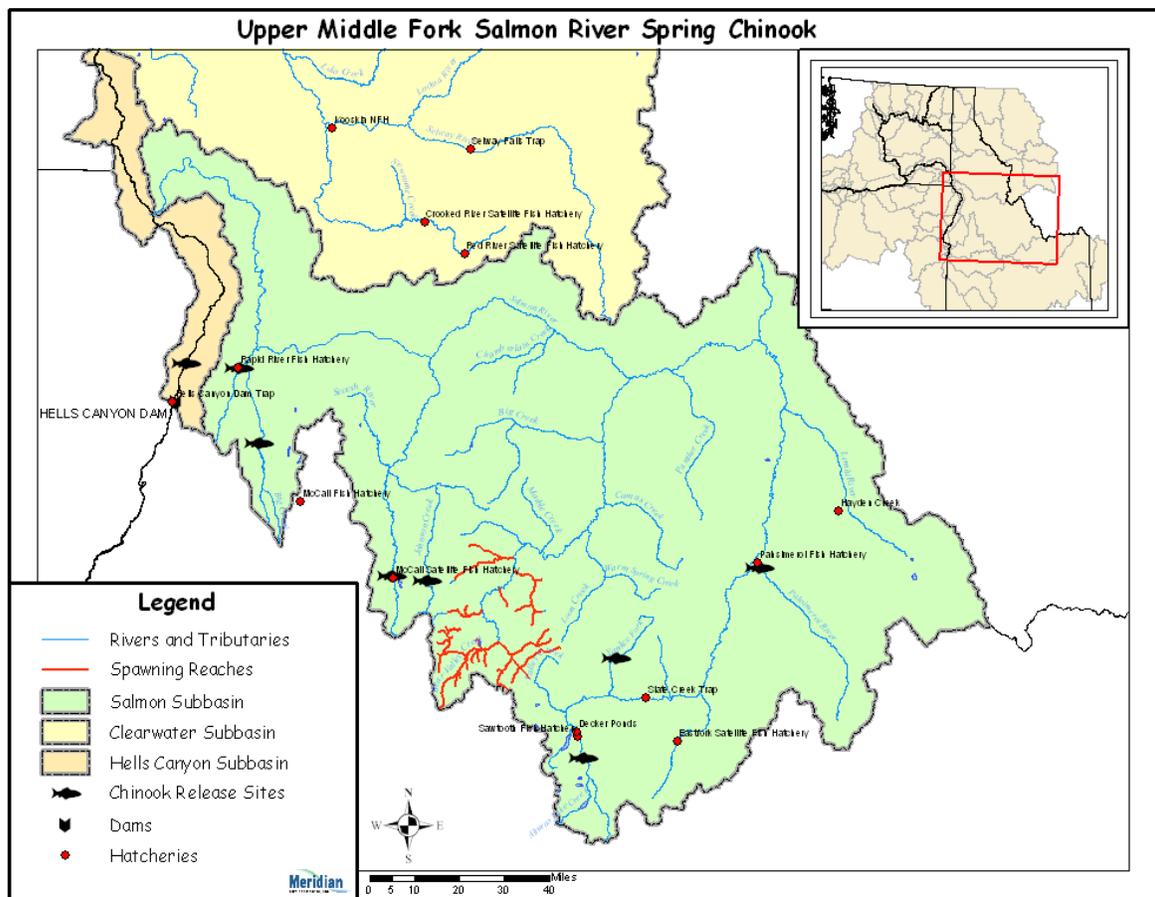
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Lower Mainstem Salmon River Spring/Summer Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 5% | 0.00 | 63 | 0.9 | 7 | - |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 311 | 1.4 | 34 | - |
| HSRG Solution | None None | - | 0% | 0% | 7% | 0.00 | 59 | 0.9 | 6 | - |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 2% | 0.00 | 306 | 1.4 | 33 | - |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Middle Fork Salmon Upper Mainstem Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Middle Fork Salmon Upper Mainstem Spring Chinook

This population is considered part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) listed this population as “Intermediate” based on its historic habitat potential. An “Intermediate” population is one that requires a minimum abundance of 750 natural spawners and an intrinsic productivity greater than 1.76 recruits per spawner (R/S) to be viable.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to the Upper Mainstem of the Middle Fork Salmon is unknown but was likely in the low thousands.

2 Current Conditions

Adult spring/summer Chinook returns to the subbasin consist of natural-origin fish only. This natural-origin population is listed as Threatened. The population includes all Chinook spawning in the mainstem Middle Fork above Indian Creek. Spawning occurs from mid-July through late September. Juveniles leave the system as yearlings starting in early March with migration continuing into spring.

Current population abundance (number of adults spawning in natural production areas) is unknown. Fewer than 50 redds were counted in the Middle Fork Mainstem Salmon River from 1995-2002 (the data were not broken out for upper and lower mainstem areas) (NPPC 2004). From 1961 through 1977, an average of 16 redds were counted in for the mainstem area between the mouth of Sulphur Creek and the confluence of Marsh and Bear Valley Creeks (StreamNet).

AHA modeling data submitted by IDFG estimate current adult escapement and adjusted productivity for the natural-origin population at 255 and 1.37, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Upper Mainstem Middle Fork Salmon River Chinook population as “Intermediate” and identified a minimum abundance threshold of 750 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Intermediate” is 1.76..
- **Habitat Productivity and Capacity:** Productivity: 1.50; Capacity: 1,000

2.2 Current Hatchery Programs Affecting this Population

There is no Chinook salmon hatchery program operating in the Middle Fork Salmon River drainage.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 0 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would be unchanged at 1.4. Average abundance of natural-origin spawners (NOS) would increase from approximately 254 fish to approximately 311 fish. The harvest contribution of the natural population would go from approximately 28 fish to 34 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Upper Mainstem Middle Fork Salmon River Chinook salmon that emphasizes maintaining existing natural spawning populations. Currently this population is consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

There are no releases of hatchery-origin Chinook salmon within the Middle Fork Salmon River Major Population Group.

Recommendations

The HSRG recommends that managers continue to monitor status and trend information for natural populations of Chinook salmon in the Upper Mainstem Middle Fork Salmon River as well as monitor presence/absence and the proportion of hatchery fish in natural production areas.

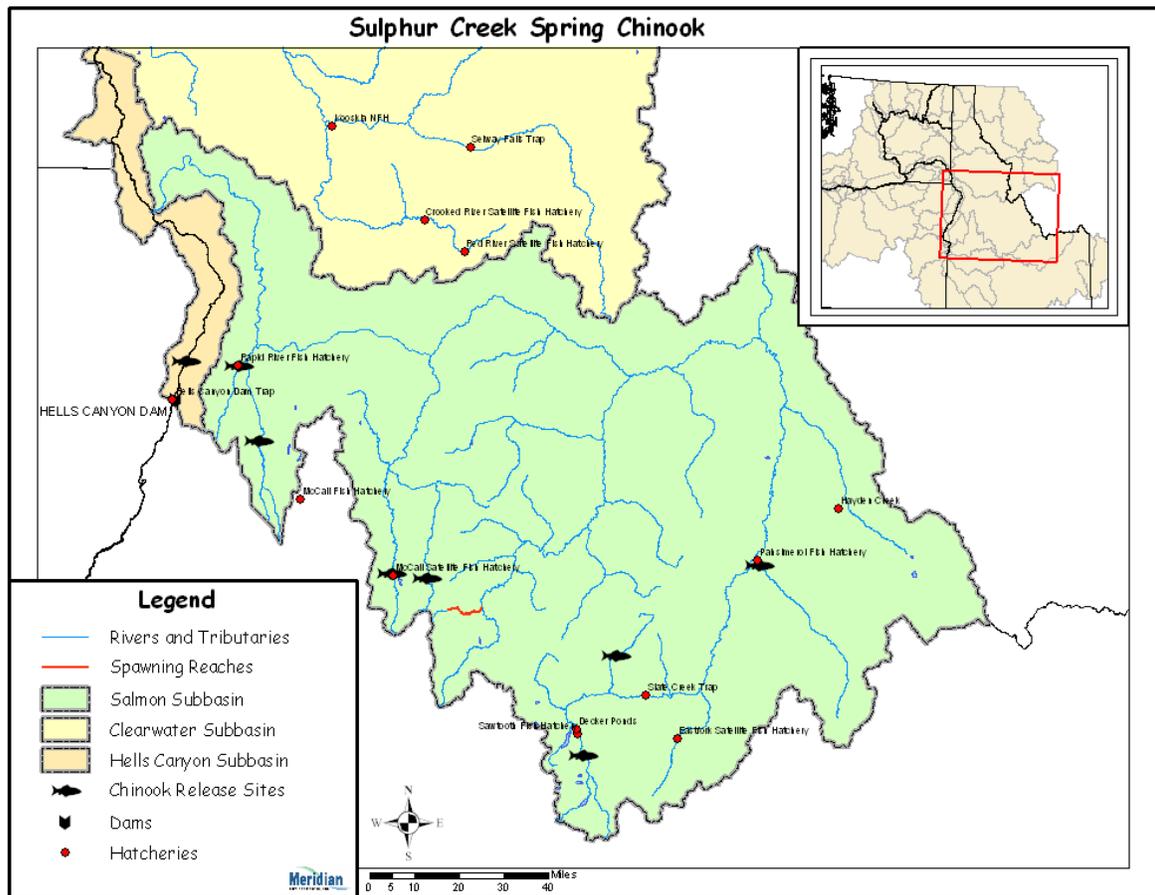
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Upper Mainstem of the Middle Fork Salmon Spring/Summer Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 254 | 1.4 | 28 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 311 | 1.4 | 34 | - |
| | | | | | | | | | | |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 307 | 1.4 | 33 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 416 | 1.6 | 45 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon - Sulphur Creek Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Salmon Sulphur Creek Spring Chinook

This population is considered part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) listed this population as “Basic” based on its historic habitat potential. A “Basic” population is one that requires a minimum abundance of 500 natural spawners and an intrinsic productivity greater than 2.21 recruits per spawner (R/S) to be viable.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to the Sulphur Creek is unknown, but was likely in the low thousands.

2 Current Conditions

Adult spring/summer Chinook returns to the subbasin consist only of natural-origin fish. The natural-origin population is listed as Threatened. This population includes those fish that spawn in Sulphur Creek. Spawning does not take place in the lower one-mile of the stream. Spawning occurs from mid-July through late September. Juveniles leave the system as yearlings starting in early March, with migration continuing into spring.

Current (1957 to 2003) wild population abundance (number of adults spawning in natural production areas) has ranged from no observed redds (1984, 1994, and 1999) to 757 fish in 1969. Abundance in recent years has been highly variable. The most recent 10-year geomean number of natural spawners was 21 fish. Between 1990 and 2001, redd counts in Sulphur Creek ranged from 0 to ~650 (StreamNet).

AHA modeling data submitted by IDFG estimate current adult escapement and adjusted productivity for the natural-origin population at 137 and 1.64, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Sulphur creek Chinook population as “Basic” and identified a minimum abundance threshold of 500 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Basic” is 2.21.
- **Habitat Productivity and Capacity:** Productivity: 1.80; Capacity: 360

2.2 Current Hatchery Programs Affecting this Population

There is no Chinook salmon hatchery program operating in the Middle Fork Salmon River drainage.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 0 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would go from 1.6 to 1.7. Average abundance of natural-origin spawners (NOS) would increase from approximately 137 fish to approximately 158 fish. The harvest contribution of the natural population would go from approximately 15 fish to 17 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager’s goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Sulphur Creek Chinook salmon that emphasizes maintaining existing natural spawning populations. Currently this population is consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

There are no releases of hatchery-origin Chinook salmon within the Middle Fork Salmon River Major Population Group.

Recommendations

The HSRG recommends that managers continue to monitor status and trend information for natural populations of Chinook salmon in Sulphur Creek as well as monitor presence/absence and the proportion of hatchery fish in natural production areas.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Sulphur Creek Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 137 | 1.6 | 15 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 158 | 1.7 | 17 | - |
| | | | | | | | | | | |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 155 | 1.7 | 17 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 195 | 1.9 | 21 | 0 |
| | | | | | | | | | | |

1 East Fork/South Fork Salmon-Johnson Creek Summer Chinook

The East Fork South Fork Salmon River Chinook population is part of the Snake River Spring/Summer Chinook ESU. The East Fork South Fork population is a summer run and is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) listed this population as “Large” based on its historic habitat potential. A “Large” population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.56 recruits per spawner (R/S) to be viable.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to the East Fork Salmon River and Johnson Creek is unknown, but was likely in the thousands.

2 Current Conditions

The East Fork/South Fork Salmon Chinook population is primarily a summer run. Adult returns to the subbasin consist of both hatchery- and natural-origin fish, as there is an integrated hatchery program operated by the Nez Perce Tribe in Johnson Creek. The population includes Chinook from both Johnson Creek and the extirpated component from the East Fork South Fork Salmon River. Natural- and hatchery-origin components of this population are listed as Threatened. Spawning occurs from mid-August through late October. Juveniles leave the system as yearlings starting in early March and continue into the spring.

Current (1957 to 2003) natural population abundance (number of adults spawning in natural production areas) has ranged from 58 fish in 1995 to 3,260 fish in 1960. Abundance in recent years has been highly variable. The most recent 10-year geometric mean number of natural spawners was 321 fish (NOAA Draft Recovery Plan). Redd counts in index areas from 1992-2003 generally ranged from less than 100 to 800 (StreamNet).

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for this population at 562 and 1.16, respectively. The model also estimates that 3 hatchery-origin spring and summer Chinook stray into this population each year from out-of-population hatchery programs.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the East Fork South Fork Salmon River Chinook population as “Large” and identified a minimum abundance threshold of 1,000 natural-origin adults.
- **Productivity Improvement Expectation** The ICTRT productivity standard associated with a population defined as “Large” is 1.56.
- **Habitat Productivity and Capacity:** Productivity: 1.45; Capacity: 1,700

2.2 Current Hatchery Programs Affecting this Population

The primary hatchery program affecting this population is the Johnson Creek summer Chinook integrated program. This program releases approximately 100,000 smolts to Johnson Creek each year. All juvenile fish are marked with an elastomer tag and coded wire-tags. In addition, a minimum of 5,000 smolts receive PIT-tags. Smolts are transported from McCall Hatchery at 26-28 fish per pound and released into Johnson Creek (near Wapiti Ranch). Broodstock for the program is collected at the adult weir on Johnson Creek (100% NOR goal). Adults are transferred from the weir site to the South Fork Salmon River satellite facility for holding and spawning. Egg incubation and juvenile rearing occurs at the McCall Hatchery. Natural-origin and supplementation-origin adults are passed upstream of the weir to spawn in the habitat. The estimated program R/S value is 6.0.

The IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study that will continue through 2012. The program incorporates treatment and control streams in the Clearwater and Salmon subbasins. Johnson Creek was initially a control stream for this program but due to the initiation of the integrated hatchery program, its role within the experimental design has been modified. “Treatments” include the development and release of “supplementation” smolts (hatchery x natural parents) and the release of “supplementation” adults to treatment spawning streams (50:50 hatchery: natural-origin release design). In 2004, juvenile treatments ended in all but three study streams. In 2007, adult treatments ended. The study will conclude in 2014 following a five-year period of “no treatment” evaluation.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 379 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: three fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The

solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008). Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.2 to 1.4. Average abundance of natural-origin spawners (NOS) would decrease from approximately 561 fish to approximately 484 fish. The harvest contribution of the natural and hatchery populations would go from approximately 110 fish to approximately 53 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for East Fork South Fork Salmon River Chinook salmon that emphasizes maintaining existing natural spawning populations as well as using hatchery-origin Chinook salmon in an attempt to augment natural production. Currently this population and the integrated hatchery program are operated consistent with the HSRG-defined standards of a Primary population (PNI >0.67) and appears to be providing a demographic benefit to the population.

The current integrated program collects broodstock (100% NOR goal) from rack returns at the Johnson Creek facility. Adult holding and spawning occurs at the McCall Fish Hatchery satellite facility on the South Fork of the Salmon River. Incubation and rearing occurs at the McCall Fish Hatchery. The current production target for the program is 100,000 yearling smolts. Average SAR and R/S values for hatchery-produced fish are 0.4% and 6.0, respectively.

The HSRG acknowledges that managing for the recommended PNI values may not be possible or appropriate when abundance levels are low and demographic risks to the population increase. To address this concern, it is the HSRG's understanding that managers have developed a variable sliding scale for managing abundance so that in low abundance years, more hatchery-origin fish of the appropriate population component are allowed to reach the spawning grounds to reduce demographic risk to the respective populations.

Recommendations

The HSRG has no specific recommendations for this program except that managers continue to implement their apparently successful BKD risk management strategies, which include culling.

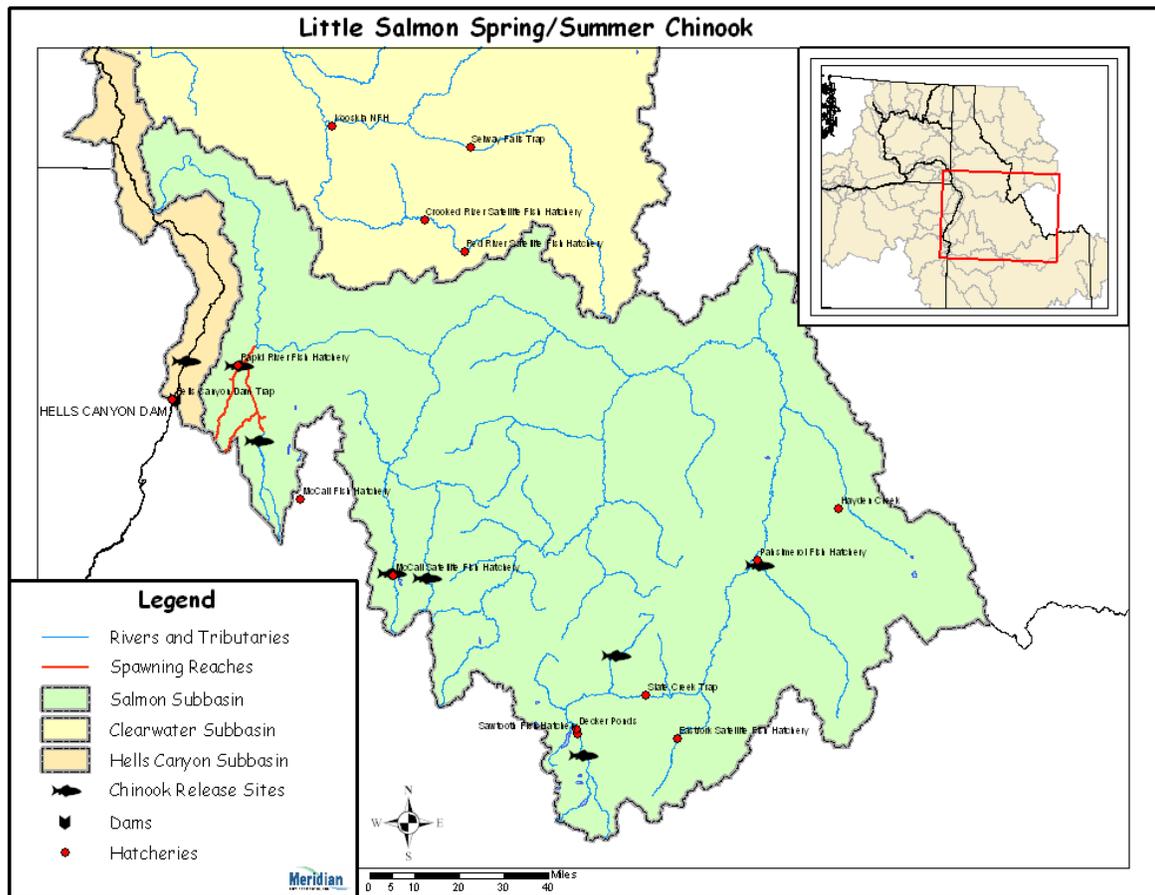
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Johnson Creek Summer Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 101.8 | 0% | 0% | 35% | 0.74 | 561 | 1.2 | 110 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 484 | 1.4 | 53 | - |
| HSRG Solution | Int Both | 101.8 | 0% | 0% | 33% | 0.75 | 643 | 1.2 | 121 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Both | 101.8 | 0% | 0% | 29% | 0.77 | 790 | 1.4 | 137 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Little Salmon River Spring/Summer Chinook Population and Related Hatchery Programs

January 31, 2009



1 Little Salmon River Spring/Summer Chinook

The Little Salmon Chinook population is part of the Snake River Spring/Summer Chinook ESU. The Little Salmon River population is a spring/summer run and is one of four extant populations in the South Fork Salmon MPG. The natural population is classified as threatened under the Endangered Species Act. Rapid River Hatchery, located on a tributary to the Little Salmon River, produces a stock of spring Chinook salmon that are not considered part of the Snake River spring/summer Chinook salmon ESU. The Interior Columbia Technical Review Team (ICTRT) listed this population as “Intermediate” based on its historic habitat potential. However, the ICTRT stated that for meeting abundance and productivity viability criteria, this stock can be considered a “Basic” population. A “Basic” population is one that requires a minimum abundance of 500 wild spawners and an intrinsic productivity greater than 2.3 recruits per spawner (R/S) to be viable.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPCC 2004). The portion returning to the Little Salmon River is unknown but was probably in the thousands. Spawning likely took place in the Little Salmon River, Rapid River and Whitebird and Slate creeks.

2 Current Conditions

Adult spring/summer Chinook returns to the subbasin consist primarily of hatchery origin fish, from a segregated hatchery program at the Rapid River Hatchery. Spring Chinook were brought to the Little Salmon River by IDFG as mitigation for the lost run and fishery in the Snake River from construction of the Hells Canyon Complex. Rapid River, a tributary of the Little Salmon, has a small natural run of summer Chinook. Rapid River has high quality habitat that is protected because the basin is part of the Wild and Scenic Rivers system. Habitat conditions in the Little Salmon River subbasin have been severely degraded by agriculture activities and the presence of State Highway 95 that runs along the lower 55 kilometers of the stream. There are over 1,500 water diversions in the watershed. Additionally, the headwaters of the Little Salmon are currently blocked to anadromous fish by a series of rock falls.

Spawning occurs from mid-July through late October only in the lower portion of the river. Upstream habitat is blocked. Juveniles leave the system as yearlings starting in early March and continue into the spring.

Redd count trend information is not collected for this population. Fish counts at the Rapid River Hatchery velocity barrier indicate that run size back to the basin is highly variable, ranging from less than 1,000 to over 12,000 fish and is dominated by hatchery-origin fish. Since 1995, all natural-origin fish have been passed upstream of the hatchery velocity barrier.

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 174 and 0.55, respectively. The model also estimates that 235 hatchery-origin spring and summer Chinook stray into this population each year.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Stabilizing. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Little Salmon River Chinook population as “Intermediate/Basic” and identified a minimum abundance threshold of 500 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Basic” is 2.21.
- **Habitat Productivity and Capacity:** Productivity: 1.30; Capacity: 1,250

2.2 Current Hatchery Programs Affecting this Population

The Rapid River Fish Hatchery was constructed in 1964 by the Idaho Power Company as part of its hatchery program to mitigate for losses of anadromous fish associated with the construction and operation of the Hells Canyon Complex. Originally the Rapid River Hatchery was an experimental facility for artificially propagating spring Chinook salmon, summer steelhead, and to a lesser extent, fall Chinook salmon. After unsuccessful attempts, efforts to rear steelhead and fall Chinook salmon at Rapid River were abandoned, the facility was dedicated to spring Chinook salmon production. Following implementation of the Hells Canyon Settlement Agreement in 1980, the role of Rapid River Fish Hatchery was defined as a production facility for 2 million Rapid River spring Chinook salmon smolts and 1 million Snake River spring Chinook salmon smolts annually. The hatchery is located on Rapid River, a tributary to the Little Salmon River, 11.3 kilometers from Riggins. An adult trap, located 2.4 kilometers downstream of the main hatchery, is used for trapping hatchery spring Chinook salmon and monitoring wild steelhead, hatchery steelhead strays, wild spring/summer Chinook salmon and bull trout.

In most years, spring Chinook salmon are trapped at Hells Canyon Dam to supplement the Rapid River Fish Hatchery program. Trapping takes place four days per week and usually occurs from early May through mid-July. Spring Chinook salmon trapped at Hells Canyon are transported to Oxbow Fish Hatchery for temporary holding before being transported to the Rapid River Hatchery for holding and spawning. During years when the number of collected green eggs exceeds Rapid River’s incubation capacity, green eggs are transferred to Oxbow for incubation.

IDFG’s current production plan, in cooperation with the Nez Perce Tribe, is to release approximately 3 million yearling Chinook salmon smolts annually (2.3 million to Rapid River, approximately 200,000 to the Little Salmon River, and approximately 500,000 to the Snake River downstream of Hells Canyon Dam). Actual release numbers have varied, averaging approximately 2.3 million smolts for brood years 1993 through 2005. All adult trapping, holding, spawning, incubation, and rearing occurs at the Rapid River facility. All fish are adipose fin-clipped and a portion coded wire and PIT-tagged for

evaluation purposes. The average SAR R/S for the hatchery program is 0.4% and 6.0, respectively.

Spring Chinook salmon broodstock development for Rapid River Fish Hatchery occurred from 1964 through 1969 when wild spring Chinook salmon adults were trapped at Oxbow and Hells Canyon dams and transferred to Rapid River Fish Hatchery. There are no records to suggest that spring Chinook salmon from other locations contributed to the development of this broodstock. The one exception is the probable contribution of wild Rapid River summer Chinook salmon. Before mass marking of all hatchery-reared spring Chinook salmon smolts began in 1992, returning adults were indistinguishable from wild summer Chinook adults. IDFG's subjective efforts at temporal segregation of the two groups were probably incomplete. Results of genetic analysis of marked hatchery adults (spring Chinook salmon) and unmarked natural adults (summer Chinook salmon) returning to Rapid River in 1997 suggest that the two stocks are no longer genetically distinct (Moran 1998).

The Rapid River Hatchery program is not part of the Idaho Supplementation Study.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: zero fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 235 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.2. Average abundance of natural-origin spawners (NOS) would decrease from approximately 174 fish to approximately 146 fish. The harvest contribution of the natural and hatchery populations would go from approximately 7,461 fish to 29 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Little Salmon River Chinook that emphasizes maintaining existing natural spawning populations as well as maintaining the current hatchery mitigation program. Currently this population is not consistent with the HSRG-defined standards of either a Primary or Contributing population (pHOS greater than 0.1). The Little Salmon River spring/summer Chinook is managed primarily for harvest.

The current segregated spring Chinook harvest program collects broodstock from rack returns at the Rapid River Fish Hatchery. All adult holding, spawning, incubation and rearing occur at this location. Additional adult trapping and egg incubation occur at the Oxbow Fish Hatchery near Oxbow Dam on the Snake River. The current Idaho Power Company mitigation target for the program is 3.0 million yearling smolts. IDFG and the Nez Perce Tribe have agreed to a release strategy of 2.3 million smolts to Rapid River, approximately 200,000 to the Little Salmon River, and approximately 500,000 to the Snake River downstream of Hells Canyon Dam. Average SAR and R/S values for hatchery-produced fish are 0.4% and 6.0, respectively.

IDFG's implementation of BKD risk management strategies, including culling, has been very successful. The program produces a large number of hatchery fish not needed for broodstock that could be used for nutrient enhancement.

Recommendations

Managers should use available carcasses from adult collection and spawning operations for nutrient enhancement.

The HSRG recommends that the managers continue to implement their apparently successful BKD management strategies, which include culling.

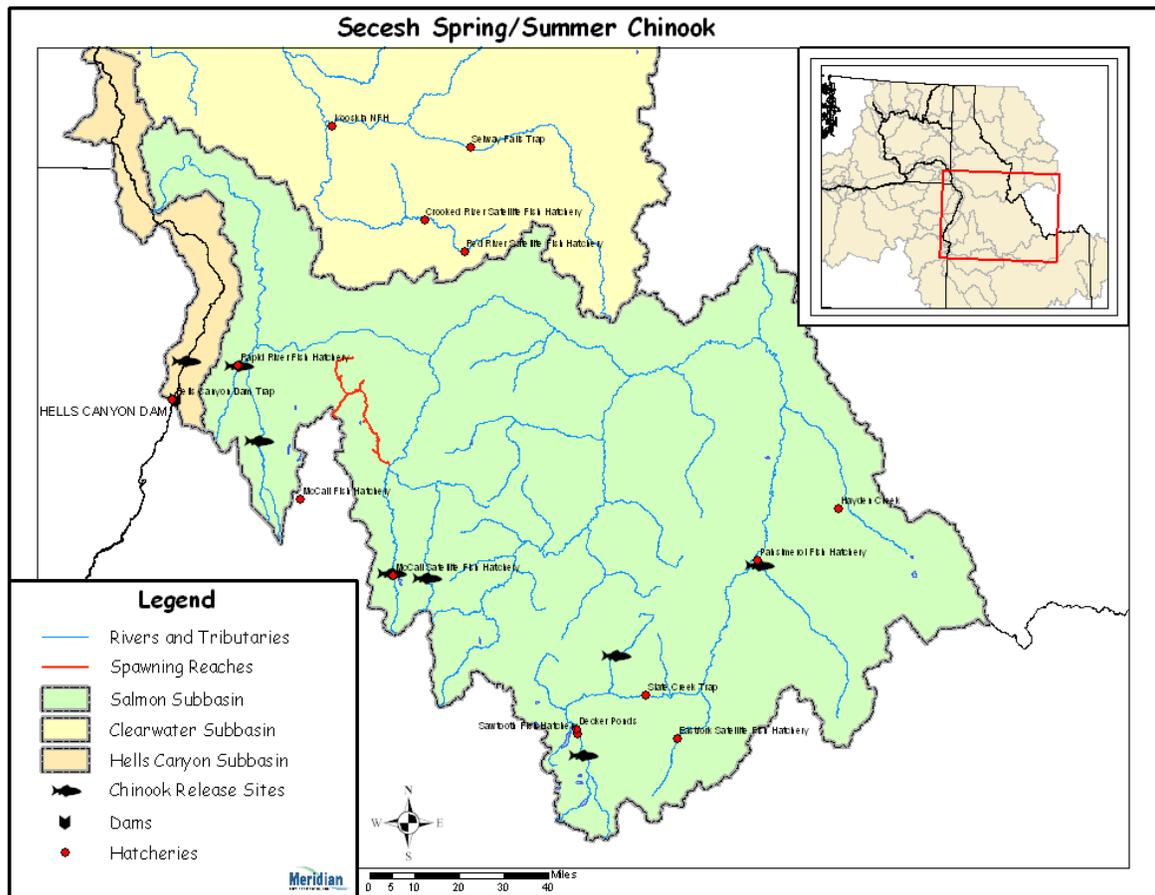
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Little Salmon River Spring/Summer Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|---------------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 52% | 0.00 | 174 | 0.6 | 35 | 0 |
| | Seg Harv | 2,736.6 | 95% | | | | | | 7,204 | 2,686 |
| | Snake Mainstem (Oxbow) Seg Harv | 299.5 | 95% | | | | | | 222 | 565 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 146 | 1.2 | 29 | - |
| HSRG Solution | None None | - | 0% | 0% | 50% | 0.00 | 196 | 0.6 | 39 | 0 |
| | Seg Harv | 2,736.6 | 95% | | | | | | 7,584 | 2,931 |
| | Snake Mainstem (Oxbow) Seg Harv | 299.5 | 95% | | | | | | 234 | 595 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 47% | 0.00 | 227 | 0.6 | 45 | 0 |
| | Seg Harv | 2,736.6 | 95% | | | | | | 7,584 | 2,931 |
| | Snake Mainstem (Oxbow) Seg Harv | 299.5 | 95% | | | | | | 234 | 595 |

Hatchery Scientific Review Group Review and Recommendations

Salmon - Secesh River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Salmon Secesh River Spring/Summer Chinook

The Secesh Chinook population is part of the Snake River Spring/Summer Chinook ESU. The Secesh River population is a summer run and is classified as threatened under the Endangered Species Act. The Interior Columbia Technical Recovery Team (ICTRT) listed this population as “Intermediate” based on its historic habitat potential. An “Intermediate” population is one that requires a minimum abundance of 750 natural spawners and an intrinsic productivity greater than 1.76 recruits per spawner (R/S) to be viable.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPCC 2004). The portion returning to the Secesh River is unknown, but was probably in the thousands.

2 Current Conditions

Adult spring/summer Chinook returns to the subbasin consist of both natural-origin and a few hatchery-origin strays from outside the population. Both natural- and hatchery-origin (except strays from Rapid River Hatchery) components of this population are listed as Threatened. Spawning occurs from mid-July through late October in the Secesh River, Lake Creek and Lick Creek.

Current (1957 to 2003) natural abundance (number of adult spawning in natural production areas) has ranged from 71 fish (1975 and 1995) to 1,178 fish in 1960. Abundance in recent years has been variable. The most recent 10-year geomean number of natural spawners was 304 fish (NOAA Draft Recovery Plan). Annual adult spawner abundance in the Secesh River generally has been less than 500 fish from 1990-2001 (NPCC 2004).

AHA modeling data submitted by IDFG estimate current adult escapement and adjusted productivity for this population at 372 and 1.38, respectively. Riparian habitat in the subbasin is degraded and sediment levels are relatively high due to legacy mining.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Secesh River Chinook population as “Intermediate” and identified a minimum abundance threshold of 750 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Intermediate” is 1.76.
- **Habitat Productivity and Capacity:** Productivity: 1.62; Capacity: 1,350

2.2 Current Hatchery Programs Affecting this Population

There is no hatchery stock associated with this Chinook population; however, AHA modeling indicates that some hatchery strays from the following programs may spawn in the Secesh River:

- Salmon/ Little Salmon Spring Chinook (Rapid River Hatchery)
- Salmon/ East Fork/South Fork Johnson Creek Summer Chinook
- Salmon/ South Fork Salmon Summer Chinook (McCall Hatchery)
- Salmon/ Pahsimeroi Summer Chinook (Pahsimeroi Hatchery)

The IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study that will continue through 2012. The study incorporates treatment and control streams in the Clearwater and Salmon subbasins. The Secesh River is a Control stream for this program. “Treatments” include the development and release of “supplementation” smolts (hatchery x natural parents) and the release of “supplementation” adults to treatment spawning streams (50:50 hatchery and natural-origin release design). In 2004, juvenile treatments ended in all but three study streams. In 2007, adult treatments ended. The study will conclude in 2014 following a five-year period of “no treatment” evaluation.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: Four fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.4 to 1.6. Average abundance of natural-origin spawners (NOS) would increase from approximately 371 fish to approximately 496 fish. The harvest contribution of the natural and hatchery populations would go from approximately 41 fish to approximately 54 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Secesh River Chinook salmon that emphasizes maintaining existing natural spawning populations. Currently this population is consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

Recommendations

The HSRG recommends that managers continue to monitor status and trend information for this natural population as well as the proportion of hatchery fish in natural production areas.

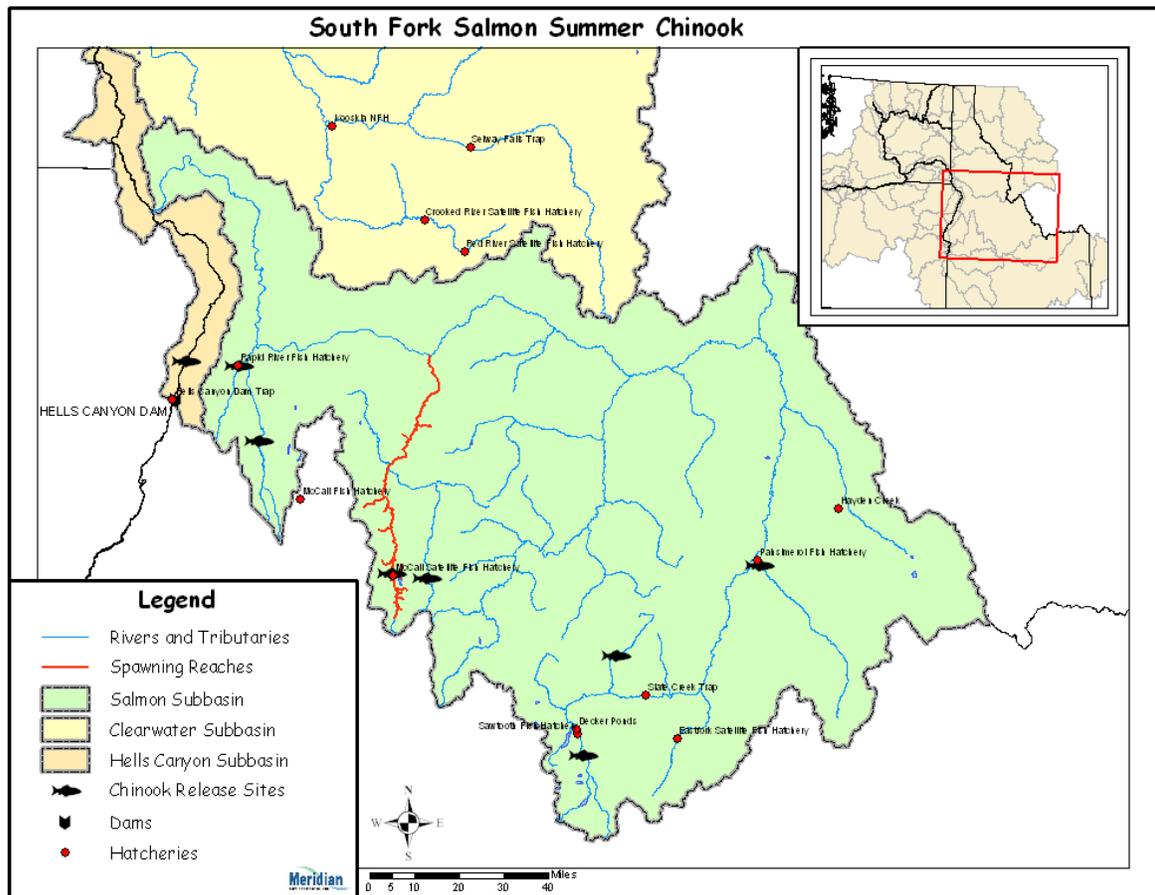
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Secesh River Spring/Summer Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 371 | 1.4 | 41 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 496 | 1.6 | 54 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 411 | 1.4 | 45 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 592 | 1.6 | 65 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon South Fork Summer Chinook Population and Related Hatchery Programs

January 31, 2009



1 Salmon South Fork Summer Chinook

The South Fork Salmon Chinook population is part of the Snake River Spring/Summer Chinook ESU and is listed as threatened under the Endangered Species Act. The Interior Columbia Technical Review Team (ICTRT) listed this population as “Large” based on its historic habitat potential. A “Large” population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.56 recruits per spawner (R/S) to be viable.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to the South Fork Salmon River is unknown, but was probably in the thousands.

2 Current Conditions

Adult summer Chinook returns to the subbasin consist of both natural- and hatchery-origin fish from both segregated and supplementation programs. Natural- and hatchery-origin components of this population are listed as Threatened. This population includes the South Fork mainstem, Poverty Flat and Stolle Meadows, and extends the full length of the South Fork Salmon River and to contiguous minor downstream tributaries to the Little Salmon River. Spawning occurs from mid-August through late October. Juveniles emigrate from the system in the spring as yearlings.

Current (1957 to 2001) natural abundance (number of adult spawning in natural production areas) has ranged from 224 (1995) to 5,290 fish in 1960. Abundance in recent years has been variable. The most recent 10-year geomean number of natural spawners was 556 (NOAA Draft Recovery Plan).

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 670 and 1.27, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Spring/Summer Chinook are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for a Stabilizing population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the South Fork Salmon River Chinook population as “Large” and identified a minimum abundance threshold of 1,000 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Large” is 1.56.
- **Habitat Productivity and Capacity:** Productivity: 3.0; Capacity: 2,150

2.2 Current Hatchery Programs Affecting this Population

There are two hatchery programs that potentially affect this population: the South Fork Salmon River segregated mitigation program and the Johnson Creek integrated conservation/supplementation program.

This South Fork Salmon River program (McCall Fish Hatchery) was established as a harvest mitigation program and is funded by BPA through the Lower Snake River Compensation Program. This segregated program releases approximately 1.0 million smolts to the South Fork Salmon River at Knox Bridge each year. All yearling smolts are adipose-fin clipped with a portion coded wire and PIT-tagged for evaluation purposes. Adult summer Chinook salmon are trapped at the satellite facility on the South Fork Salmon River approximately 42 km east of Cascade, ID. Spawning takes place at the trap site with incubation and rearing occurring at the McCall Fish Hatchery on the Payette River in McCall.

The program was founded with adult summer Chinook salmon collected between 1974 and 1979 at Ice Harbor, Little Goose, and Lower Granite dams. Adults were collected from the summer run period at the dams to obtain fish that were locally adapted to the South Fork Salmon River. Early collections established an egg bank program prior to the completion of the hatchery. Between 1976 and 1980, smolts produced from these early collections were planted in the South Fork Salmon River upstream of the present location of the weir. Since 1981, all adults used for broodstock purposes have been collected at the South Fork Salmon River weir. The program has an R/S value of 6.0.

The South Fork Salmon River summer Chinook program has been part of the Idaho Supplementation Study (ISS). In 1991, IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study that was designed to continue through 2012. The project incorporates treatment and control streams in the Clearwater and Salmon subbasins. The South Fork Salmon River is a treatment stream for this program. "Treatments" include the development and release of "supplementation" smolts (hatchery x natural parents) and the release of "supplementation" adults to treatment spawning streams (50:50 hatchery: natural-origin release design). In 2004, juvenile treatments ended in all but three ISS study streams. In 2007, adult treatments ended. The study will conclude in 2014 following a five-year period of "no treatment" evaluation.

The Nez Perce Tribe operates a summer Chinook conservation/supplementation program that releases 100,000 yearlings to Johnson Creek. This program is also assumed to have a R/S of 6.0. These fish are 100% marked with a visual implant tag and coded wire-tag. Additionally, an evaluation group of smolts is PIT-tagged. Adults for broodstock are collected at the Johnson Creek weir. Incubation and rearing occurs at the McCall Fish Hatchery. Johnson Creek is also a component of the ISS program. The Nez Perce Tribe also incubates approximately 300,000 hatchery-origin eyed eggs in Dollar Creek.

Managers have agreed to plan and implement an integrated Chinook salmon supplementation program in the South Fork Salmon River beginning in spawn year 2009.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 357 fish.

This estimate includes hatchery-origin fish on spawning grounds downstream as well as upstream of the satellite trap on the South Fork Salmon River. In 2007, a new weir and fish trap were installed. The unintentional passage of hatchery-origin adults upstream of the new weir is expected to be minimal; however, adults may stray to production areas downstream of the satellite weir. Two primary spawning areas have been identified; Poverty Flat and a section of the South Fork Salmon River immediately downstream of the adult trapping facility.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.3 to 2.7. Average abundance of natural-origin spawners (NOS) would increase from approximately 670 fish to approximately 1,326 fish. The harvest contribution of the natural and hatchery populations would go from approximately 2,990 fish to approximately 265 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where

applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for South Fork Salmon River summer Chinook that emphasizes maintaining existing natural spawning populations as well as maintaining the current hatchery mitigation program. Currently this population is not consistent with the HSRG-defined standards of either a Primary or Contributing population (pHOS greater than 0.10).

The current segregated harvest program collects broodstock from rack returns at the McCall Fish Hatchery satellite on the South Fork Salmon River. Adult holding and spawning occurs at the satellite facility. Incubation and rearing occurs at the McCall Fish Hatchery. The current production target for the program is 1.1 million yearling smolts with a LSRCP-defined mitigation goal of returning 8,000 adults to the project area upstream of Lower Granite Dam. Average SAR and R/S values for hatchery-produced fish are 0.5% and 6.0, respectively.

Three major natural production areas exist within this population: Poverty Flats (approximately 18 miles below the weir), the river section immediately downstream of the weir, and Stolle Meadows (4 miles upstream of the weir). The weir was replaced in 2007 and is located approximately 50 miles upstream of the confluence with the Salmon River.

The ongoing Idaho Supplementation Study is ending in 2012. Adult returns from this program ended in 2007. The current phase of the study monitors production and productivity in the absence of adult supplementation. Following 2012, managers will have greater flexibility to pursue other management options.

IDFG's implementation of BKD risk management strategies, including culling, has been very successful.

Recommendations

The HSRG recommends that managers implement a two-stage stepping stone program to support the natural population and to provide harvest. The program consists of an integrated conservation component producing approximately 250,000 smolts (PNI = 0.67, pHOS = 0.15, pNOB = .30%). Initially, this component would be produced from 100% NOB but subsequent generations would be maintained by collecting 30% natural-origin broodstock and 75% hatchery-origin returns from this integrated component. Integrated adult returns not needed to maintain the integrated broodstock would be used as broodstock for the second stage harvest component to produce approximately 750,000 smolts. This maintains some genetic continuity between the harvest component and natural fish returning to the system. Smolts produced through the integrated program could be adipose fin-clipped if sufficient numbers returned to meet escapement needs, integrated broodstock needs, as well as second stage stepping stone broodstock needs. Managers should monitor this closely and revert to code wire only if insufficient adults

return to meet all needs. Smolts produced for harvest would be adipose fin-clipped. Unharvested “harvest component” fish would not be used for broodstock, released upstream of the weir, or returned to population downstream of the weir. Unharvest adults could be used for stream nutrification as appropriate.

The HSRG acknowledges that managing for the recommended PNI values may not be possible or appropriate in the near term when abundance levels are low and demographic risks to the population increase. To address this concern, managers should develop a variable sliding scale for managing abundance so that in low abundance years, more hatchery-origin fish of the appropriate population component are allowed to reach the spawning grounds to reduce demographic risk to the respective populations.

An example of such a sliding scale would look like this:

Each year, depending on NOR run size, pNOB and pHOS are allowed to “float” or slide. The HSRG assumes managers will establish an acceptable level of removal of NORs for use in the hatchery brood. This will be a fixed percentage of the total NOR return (say 40%) and will not change, regardless of NOR return. In years of high NOR abundance, this 40% could make up 100% of the needed hatchery brood (pNOB= 100%). In that case, no HORs would be used in the hatchery brood. Hatchery fish can be allowed to reach the spawning ground (pHOS) if needed to achieve an appropriate number of fish spawning naturally (demographic benefit and use of available habitat). This however, would not be required during years of very high NOR returns as both objectives (pNOB and natural spawning) may be met with NORs.

In years of low NOR abundance, the same 40% of the NOR return would be removed for use in the hatchery brood (pNOB). However, in these years, that 40% may make up only a small part of the needed brood (i.e. pNOB 10%). In these years, enough HORs should be used to achieve needed hatchery brood and additional HORs should be allowed to spawn naturally (pHOS) to achieve the minimum acceptable level of naturally spawning.

The goal of this sliding scale is to achieve an “average” PNI over time of the desired level (0.67 or 0.5) depending on the population designation even though it may not be achieved in an one year. A good way to determine the level of NORs that should be removed each year (see above) is to review the return of NORs over a long time frame and iterate what level (30, 40, 50%) are needed, on average, to achieve the desired PNI.

This recommendation results in a program consistent with a Primary population designation.

The HSRG also recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

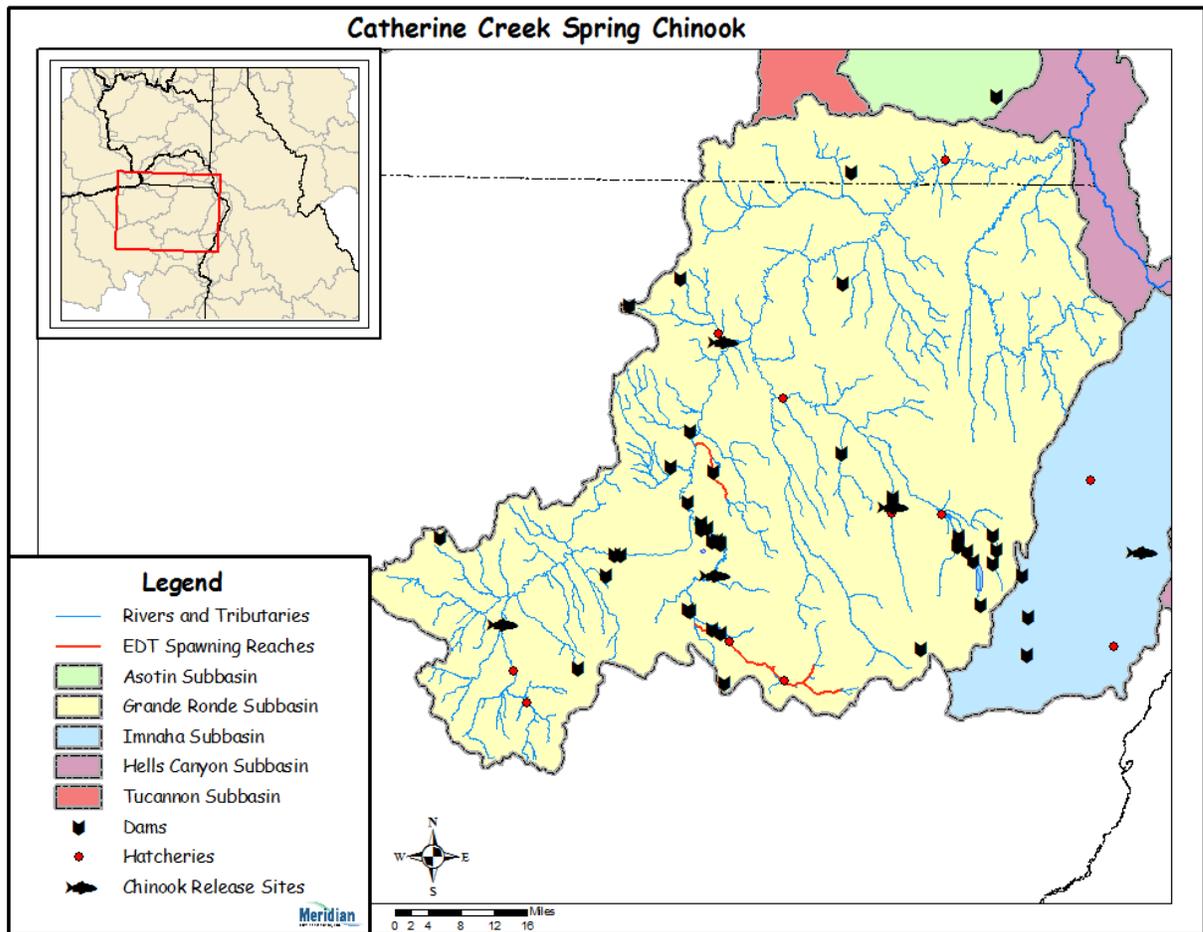
Table 1. Results of HSRG analysis of current condition and HSRG Solution for South Fork Salmon River Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 30% | 0.00 | 670 | 1.3 | 134 | 0 |
| | Seg Harv | 1,060.9 | 90% | | | | | | 2,856 | 2,408 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,326 | 2.7 | 265 | - |
| HSRG Solution | Int Cons | 253.8 | 90% | 0% | 15% | 0.67 | 1,111 | 2.2 | 705 | 115 |
| | Stepping Stone/Seg Harv | 752.9 | 90% | | | | | | 1,408 | 1,656 |
| HSRG Solution w/ Improved Habitat | Int Cons | 253.8 | 90% | 0% | 13% | 0.70 | 1,341 | 2.5 | 751 | 115 |
| | Stepping Stone/Seg Harv | 752.9 | 90% | | | | | | 1,408 | 1,656 |

Hatchery Scientific Review Group Review and Recommendations

Grande Ronde-Catherine Creek Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Grande Ronde Catherine Creek Spring Chinook

The Grande Ronde Catherine Creek Spring Chinook population is part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. This ESU has five major population groupings (MPGs), including: Lower Snake River, Grande Ronde/Imnaha, South Fork Salmon River, Middle Fork Salmon River, and the Upper Salmon River group. The ESU contains both spring and summer run Chinook.

The Grande Ronde Catherine Creek population is a spring run, and is one of seven extant populations in the Grande Ronde/Imnaha River MPG. The population includes Chinook spawning in Catherine and Indian creeks, and a small portion of the mainstem Grande Ronde.

The Interior Columbia Technical Recovery Team (ICTRT) has classified this population of Chinook as “Large” in size based on its historic habitat potential. A “Large” population is one that requires a minimum abundance of 1,000 wild spawners and an intrinsic productivity of 1.6 recruits per spawner (R/S) to be viable at the 5% extinction risk threshold. For abundance and productivity measures, the ICTRT considers Catherine Creek as an “Intermediate” population with a target abundance and productivity of 750 and 1.8, respectively. This is because habitat associated with Indian Creek and the mainstem Grande Ronde River was not included in their analysis.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to the Grande Ronde Catherine Creek is unknown, but was likely in the thousands. Spawning likely took place primarily in the mainstem Grande Ronde and Catherine Creek.

2 Current Conditions

Grande Ronde Catherine Creek spring Chinook spawn in Catherine and Indian creeks. Population diversity and abundance has likely been reduced due to habitat degradation, harvest, and juvenile and adult mortality associated with passage through the federal Columbia River hydropower system.

Recently (1955-2005), the ICTRT reports that the abundance of 3+ spring Chinook for this subbasin has ranged from 27 to 2,947 fish, with a recent 10-year geometric run size of 89. Natural-origin spawners have comprised a total of 83% of total spawners over the last 10-years. Out-of-ESU hatchery strays to the subbasin have averaged approximately 18%. The strays were primarily from Carson and Rapid rivers. The last release of Rapid River/Carson stock occurred 1989 and Rapid River stock in 1990.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for Catherine Creek Spring Chinook.

- ESA Status: Grande Ronde Catherine Creek Spring Chinook are part of the Snake River Spring/Summer Chinook ESU.

- Population Description: The Grande Ronde Catherine Creek population is considered by the ICTRT to be an “Intermediate” population for abundance. For the HSRG review, the population has been classified as Contributing.
- Recovery Goal for Abundance: 750 wild spawners
- Productivity Improvement Expectation: Increase productivity to achieve the ICTRT 1.8 R/S value
- Habitat Productivity and Capacity: Productivity 2.5; Capacity 500

2.2 Current Hatchery Programs Affecting this Population

The Grande Ronde Spring/Summer Chinook hatchery program may release up to 150,000 juveniles each year. The current target release is 130,000 smolts due to space limitations. Fish are generally released at approximately 20 fpp. All juveniles are marked with adipose fin-clip, coded wire-tags, elastomer tags or a combination of the three. Smolts are acclimated at raceways located in the subbasin. The juveniles are allowed to volitionally emigrate from the raceways starting in late March, but are then forced out in mid-April. Wild juvenile fish (500) were used as broodstock for the captive brood component, although the captive brood is currently phasing out (the last parr were collected in 2006). These fish were reared at the Manchester Research Station and/or Bonneville Hatchery. Adults for the conventional program are collected at a weir on Catherine Creek and held at Lookingglass Hatchery. Egg-incubation and juvenile rearing also occurs at this hatchery. The program has an R/S value of 6.0.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated programs: 216 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 15 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.2 to 2.3. Average abundance of natural origin spawners (NOS) would increase from approximately 181 fish to approximately 296 fish. Harvest contribution of the natural and hatchery populations would go from approximately 144 fish to approximately 43 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified both conservation and harvest objectives for this population. Their strategy for Catherine Creek spring Chinook salmon is meant to maintain existing natural spawning populations as well as use hatchery-origin Chinook salmon in an attempt to augment natural production. Currently this integrated hatchery program is not being operated consistent with the HSRG-defined standards of a Primary population or Contributing population (currently pHOS is 51% and PNI is 0.37). The managers have designed and are implementing sliding scale broodstock protocols that are designed to achieve the standards of a Primary population.

The total production objective for the Catherine Creek population is to release up to 150,000 smolts (20 fpp) derived from anadromous returns, natural-origin returns to Catherine Creek and captive broodstock. The program is partial fulfillment of the LSRCP adult return goal of 9,070 adult spring Chinook to the project area. Currently the program is releasing 130,000 smolts. The captive broodstock component is being phased out. Adults for the conventional program are collected at a weir on Catherine Creek and held at Lookingglass Hatchery. Egg-incubation and juvenile rearing also occurs at this hatchery. Smolts are acclimated and released at raceways located in the subbasin.

There appears to be considerable uncertainty about habitat capacity in various Grande Ronde watersheds. The habitat capacity provided to the HSRG is currently estimated at 500 adults. If accurate, this limited capacity significantly limits the ability to achieve conservation goals.

Cold water at Lookingglass Hatchery may limit the size of fish at release and may have a negative effect on survival.

The managers are conducting research using parent/progeny genotyping to determine relative reproductive success of natural- vs. hatchery-origin spawners.

Recommendations

The HSRG identified two possible solutions for this program. If the population is designated as Contributing, the current program of 130,000 smolts could be maintained with a PNI of 0.52. This program would use 50% natural-origin broodstock (pNOB of 0.5) and would require removing 55% of hatchery fish at the weir or through selective fisheries.

If the population is designated as a Primary, a program of 75,000 smolts could be released with a PNI of 0.69. The program would use 55% natural-origin broodstock (pNOB of 0.55) and would require removing 70% of returning hatchery-origin adults at the weir or through selective fisheries.

To meet mitigation goals established by the managers, the reduction of approximately 75,000 smolts from this program to meet the standards for a Primary population could be re-allocated to additional production in Lookingglass Creek without affecting current goals for that population.

The HSRG recommends that the managers review the existing habitat potential (productivity and capacity) as it will influence the type of program appropriate to the conditions and the contribution Catherine Creek can make to recovery.

Managers should investigate options to improve survival, such as increasing smolt size at release. A plan to increased size at release would need to consider potential changes to biological factors important to natural reproduction of hatchery-origin spawners. However, the advantage of increased survival could be realized by meeting abundance goals while releasing fewer fish and removing fewer natural-origin fish for broodstock.

The HSRG recommends that managers continue to implement their successful broodstock BKD management strategy, which includes culling.

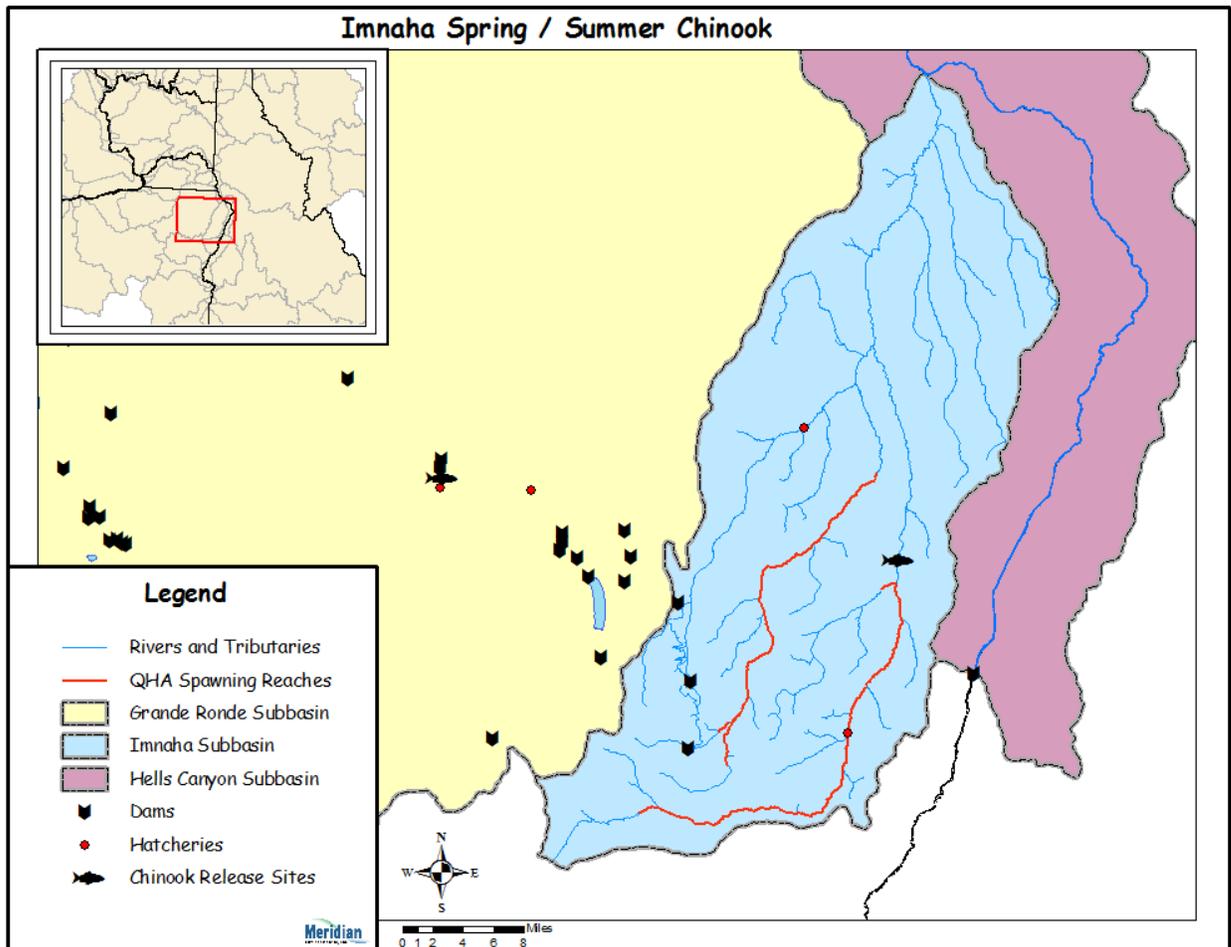
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Catherine Creek Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 130.0 | 55% | 0% | 51% | 0.37 | 181 | 1.2 | 144 | 206 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 296 | 2.3 | 43 | - |
| HSRG Solution | Int Cons | 75.6 | 70% | 0% | 25% | 0.69 | 244 | 2.0 | 110 | 185 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 75.6 | 70% | 0% | 21% | 0.72 | 298 | 2.2 | 117 | 185 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Grande Ronde-Imnaha Spring/Summer Chinook Population and Related Hatchery Programs

January 31, 2009



1 Imnaha River Spring/Summer Chinook

The Imnaha River Spring/Summer Chinook population is part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. This ESU has five major population groupings (MPGs), including: Lower Snake River, Grande Ronde/Imnaha, South Fork Salmon River, Middle Fork Salmon River, and the Upper Salmon River group. The ESU contains both spring and summer run Chinook.

The Imnaha River population is a spring/summer run, and is considered an “Intermediate”-sized population by the Interior Columbia Technical Recovery Team (ICTRT). An Intermediate population is one that requires a minimum abundance of 750 wild spawners and an intrinsic productivity of 1.8 recruits per spawner (R/S) to be viable at the 5% extinction risk threshold. A second population, Big Sheep Creek, a tributary of the Imnaha, is considered by the ICTRT to be a “Basic” population, requiring a minimum abundance of 500 wild spawners, but was classified as functionally extirpated. Big Sheep Creek includes both Little Sheep Creek and Lick Creek.

Historically, it is estimated that the Imnaha River supported one of the largest spring Chinook runs in Wallowa County. Prior to the construction of the four lower Snake River dams, maximum run size to the basin was 6,700 fish (NPPC 2004).

2 Current Conditions

The current spawning distribution for this population extends from the South Fork Imnaha River to Freezeout Creek, with a majority of fish spawning in the 17.7 miles from the “Blue Hole” to Crazyman Creek. The population has one major and one minor spawning area as defined by the ICTRT. Population diversity and abundance has likely been reduced due to hatchery practices, habitat degradation, harvest, and juvenile and adult mortality associated with passage through the federal Columbia River hydropower system.

Recently (1949-2005), the abundance of 3+ spring/summer Chinook for this subbasin has ranged from 160 to 10,992 fish, with a recent 10-year geometric run size of 395 fish. According to the ICTRT, the mean percentage of out-of-ESU strays over the last ~12 years has been 0.2%. Natural-origin spawners have comprised approximately 35% of the total escapement over the last 10 years. Smolt-to-adult return rates for natural-origin fish have ranged from 0.32 to 2.94 for brood years 1996 – 2001 (Michaels and Espinoza 2007). Recent estimates of natural- and hatchery-origin adult abundance are based on weir counts, mark-recapture estimates; redd counts and smolt-to-adult rates calculated from natural-origin fish PIT tagged at a rotary screw trap.

Hatchery-origin fish returning to the subbasin are of Imnaha River Hatchery-origin stock that are reared at Lookingglass Fish Hatchery and released into the Imnaha River.

The program has an R/S value of 11.0.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Imnaha Spring/summer Chinook.

- ESA Status: This population is part of the Snake River spring/summer Chinook ESU and is listed as Threatened.
- Population Description: The Imnaha River population is considered by the ICTRT to be an “Intermediate” population. For the HSRG review, the population has been classified as Primary.
- Recovery Goal for Abundance: To achieve the ICTRT adult target value of 1,250 fish.
- Productivity Improvement Expectation: Increase productivity to achieve the ICTRT 1.8 R/S value.
- Habitat Productivity and Capacity: Productivity: 4.0; Capacity: 1,500

2.2 Current Hatchery Programs Affecting this Population

The Imnaha Spring/Summer Hatchery program may release up to 490,000 juveniles (currently 360,000) each year to the Imnaha River. Smolts are released in mid-April to mimic natural fish emigration timing and reduce the natural and hatchery fish interactions in freshwater. Since 1999, fish have been acclimated for 3 weeks at the Imnaha Satellite Acclimation Pond, allowed to voluntarily emigrate for 2 to 4 weeks, before forced into the river in mid-April. The forced release occurs in late afternoon or early evening. No culling is applied to non-migrants. All smolts released are adipose fin-clipped and the majority are given a coded wire-tag.

Broodstock for the Imnaha River spring/summer Chinook salmon program is collected from adult returns trapped at Imnaha weir and then transferred to Lookingglass Hatchery for spawning. This includes both hatchery and naturally-produced fish. The ratio of hatchery to wild fish collected for broodstock is based on an adult escapement sliding scale. A maximum of 50% of the broodstock collected are natural-origin fish and estimated adult run size ranges from 51-700 adults. Surplus hatchery adults (up to 300) are transported and released into Big Sheep and Lick creeks.

Juvenile rearing occurs at Lookingglass, Irrigon or Oxbow hatcheries. Currently, all fish are produced at Lookingglass Hatchery. Fish are transported by truck, acclimated, and released at the Imnaha facility below the confluence of Gumboot Creek.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated programs: 1187 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 7 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the

potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.9 to 3.5. Average abundance of natural origin spawners (NOS) would increase from approximately 700 fish to approximately 1040 fish. Harvest contribution of the natural and hatchery populations would go from approximately 1,180 fish to approximately 240 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified both conservation and harvest objectives for this population. Their strategy for Imnaha Chinook salmon is meant to maintain existing natural spawning populations as well as use hatchery-origin Chinook salmon in an attempt to augment natural production. The managers have developed and are implementing sliding scale broodstock protocols that are designed to achieve the HSRG-defined standards of a Primary population; however, this population is not currently meeting the standards for a Contributing or Primary population designation (currently pHOS is 57% and PNI is 0.38) because of the inefficiencies of the existing adult weir.

The total production objective for the Imnaha population is to release up to 490,000 smolts derived from hatchery and natural-origin returns to the Imnaha River. The program is partial fulfillment of the LSRCP adult return goal of 9,070 adult spring Chinook to the project area. Currently the program is releasing 360,000 smolts. Broodstock for the Imnaha River spring/summer Chinook salmon program is collected from adult returns trapped at Imnaha weir and then transferred to Lookingglass Hatchery for spawning. This includes both hatchery and naturally-produced fish. Managers are also taking excess hatchery-origin adults at the weir and releasing them in Big Sheep Creek. Juvenile rearing occurs at Lookingglass, Irrigon or Oxbow hatcheries. Currently, all fish are produced at Lookingglass Hatchery. Fish are transported by truck, acclimated, and released at the Imnaha facility below the confluence of Gumboot Creek.

Managers have established a mitigation goal of 3,200 adults.

Broodstock is not being collected over the entire run curve due to an inability to install the weir during high flows early in the run. The managers have noted that the run and spawn timing of hatchery fish appear to be later than the natural-origin spawners.

Recommendations

The HSRG recommends that managers modify or replace the Imnaha River adult weir (to remove a minimum of 70% of unharvested returning hatchery adults) to allow better broodstock and escapement management. On average, removing this percentage of hatchery fish would be necessary to implement a two-stage conservation and harvest program consistent with the HSRG-defined standards for a Primary population. The program would consist of an integrated conservation component producing approximately 113,000 smolts (PNI = 0.68; pNOB = 65%; pHOS = 31%). This component initially would be produced by collecting 100% of its broodstock from natural-origin returns. Subsequent generations would be maintained by collecting 65% of the broodstock from natural-origin returns and 35% from hatchery origin returns from this component. Excess hatchery-origin returns from the conservation component would provide all broodstock to maintain an additional second stage harvest component of approximately 246,000 smolts. Unharvested hatchery returns from the harvest component would not be used for broodstock. This would require differential marking of juveniles from the two programs. For example, the juveniles from the conservation program would be coded-wire tagged only, while the harvest program fish would be adipose-marked and coded-wire tagged.

The HSRG recommends that managers continue to implement their successful broodstock BKD management strategy, which includes culling.

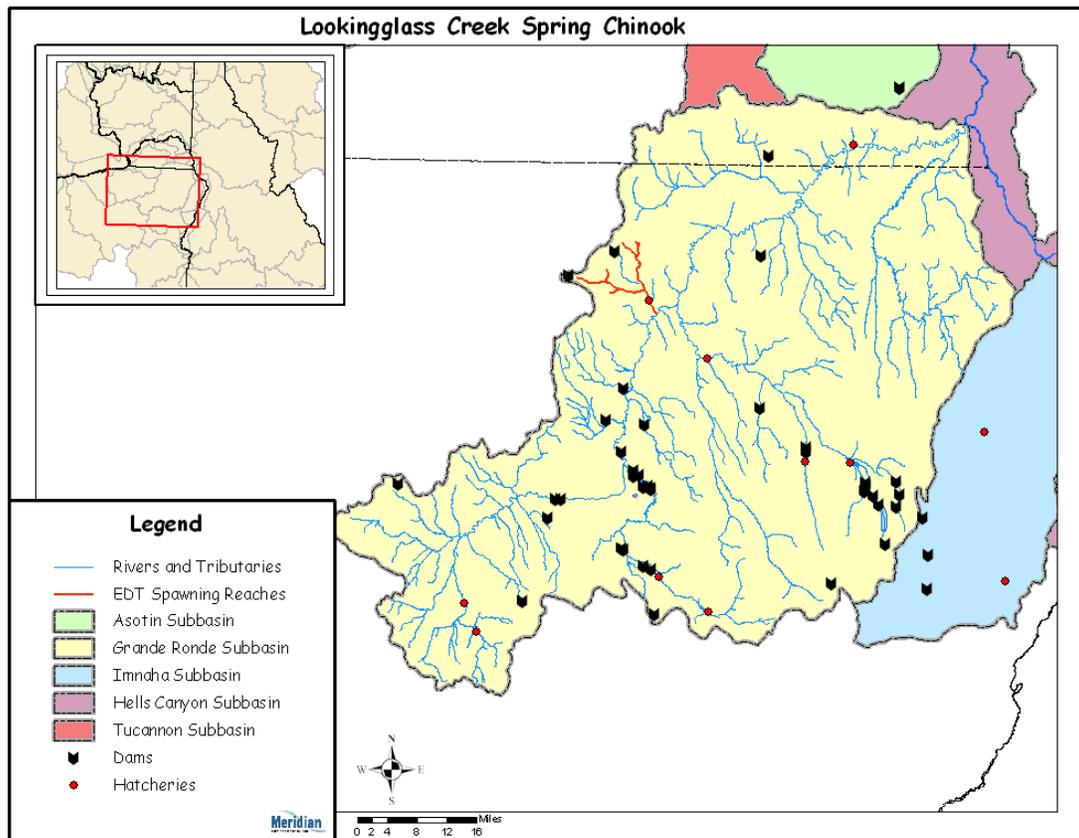
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Imnaha Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 359.2 | 35% | 0% | 57% | 0.38 | 703 | 1.9 | 1,176 | 495 |
| | Stepping Stone Seg Harv | - | 0% | | | | | | - | - |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1037 | 3.5 | 242 | - |
| HSRG Solution | Int Cons | 113.4 | 70% | 0% | 31% | 0.68 | 953 | 2.9 | 563 | 248 |
| | Stepping Stone Seg Harv | 246.2 | 70% | | | | | | 681 | 876 |
| HSRG Solution w/ Improved Habitat | Int Cons | 113.4 | 70% | 0% | 28% | 0.70 | 1092 | 3.2 | 596 | 248 |
| | Stepping Stone Seg Harv | 246.2 | 70% | | | | | | 681 | 876 |

Hatchery Scientific Review Group Review and Recommendations

Grande Ronde-Lookingglass Creek Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Grande Ronde Lookingglass Creek Spring Chinook

The Grande Ronde Lookingglass Creek Spring Chinook population is part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. This ESU has five major population groupings (MPGs), including: Lower Snake River, Grande Ronde/Imnaha, South Fork Salmon River, Middle Fork Salmon River, and the Upper Salmon River group. The ESU contains both spring and summer run Chinook.

The Grande Ronde Lookingglass Creek population is a spring run, and is considered extinct by the Interior Columbia Technical Recovery Team (ICTRT) as a result of adult collection of natural fish during the early years of Lookingglass Hatchery operations and continued natural spawning of Rapid River hatchery stock. Historically, it is estimated that 3,200 fish spawned annually in Lookingglass Creek (NPPC 2004).

2 Current Conditions

Lookingglass Creek spring Chinook spawn primarily in the mainstem river and larger tributaries (Little Lookingglass). Prior to 2004, fish were only allowed to spawn in stream reaches below the hatchery weir. After 2004, some adults were released upstream of the weir to increase natural production. Population diversity and abundance has likely been reduced due to hatchery practices, habitat degradation, harvest, and juvenile and adult mortality associated with passage through the federal Columbia River hydropower system.

The subbasin plan estimated that on average, 211 spring Chinook spawn naturally in the system each year (NPPC 2004). A large portion of these fish are likely hatchery fish released from Lookingglass Hatchery or strays from other basins.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for Lookingglass Spring Chinook.

- ESA Status: Extinct
- Population Description: For the HSRG review, the population has been classified as Stabilizing.
- Recovery Goal for Abundance: NA
- Productivity Improvement Expectation: Increase productivity to achieve the ICTRT R/S value of 1.6.
- Habitat Productivity and Capacity: Productivity: 3.0; Capacity: 200

2.2 Current Hatchery Programs Affecting this Population

The Grande Ronde Spring/Summer Chinook Hatchery program may release up to 250,000 juveniles each year to Lookingglass Creek. The program has both a captive broodstock and conventional program. The captive brood surplus from Catherine Creek may be released into Lookingglass Creek as adults, smolts, or parr. Fish are generally released at approximately 20 fpp. All juveniles are marked with an adipose fin-clip,

coded wire-tag, or a combination. The juveniles are allowed to volitionally emigrate from the raceways starting in late March, but are then forced out in mid-April. Adults for the conventional program are collected at a weir on Lookingglass Creek or Catherine Creek (surplus) and held at Lookingglass Hatchery. Egg-incubation and juvenile rearing also occurs at this hatchery. The program has an R/S value of 9.0.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated programs: 69 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 11 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.3 to 2.8. Average abundance of natural origin spawners (NOS) would increase from approximately 80 fish to approximately 130 fish. Harvest contribution of the natural and hatchery populations would go from approximately 340 fish to approximately 20 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified both harvest and reintroduction objectives for Lookingglass Creek spring Chinook. The managers' intent is to develop this hatchery program to provide (1) spawners to meet broodstock needs; (2) adults to escape to the habitat upstream of the hatchery; and (3) harvest opportunities when broodstock and escapement goals are exceeded.

This population is not meeting the HSRG-defined standards for a Primary or Contributing population. Based on population productivity and capacity information provided to the HSRG, this population makes a small contribution to population conservation. The total production objective for the Lookingglass Creek is to release 250,000 smolts (20 fpp) derived from both anadromous returns and captive broodstock. The program is partial fulfillment of the LSRCP adult return goal of 9,070 adult spring Chinook to the project area. Adults for the conventional program are collected at a weir on Lookingglass Creek or Catherine Creek (surplus) and held at Lookingglass Hatchery. Egg-incubation, juvenile rearing, and release also occurs at this hatchery.

There appears to be considerable uncertainty about habitat capacity in various Grande Ronde watersheds. The habitat capacity provided to the HSRG is currently estimated at 200 adults. If accurate, this limited capacity significantly limits the ability to achieve conservation goals.

Recommendations

The HSRG recommends that the managers review the existing habitat potential (productivity and capacity) as it will influence the type of program appropriate to the conditions and the contribution Lookingglass Creek can make to recovery.

The HSRG developed a solution that meets near-term broodstock and escapement objectives identified by the managers. It also addresses loss of harvest opportunity from reducing Catherine Creek production to meet conservation goals. This larger program (releasing 325,000 smolts) would maintain hatchery broodstock solely from hatchery-origin returns, recover 50% of the hatchery-origin returns at the weir; and allow all additional fish (natural and hatchery origin) to spawn above the weir. In addition, the HSRG's solution provides additional fish for harvest in the terminal area.

The HSRG recommends that managers continue to implement their successful broodstock BKD management strategy, which includes culling.

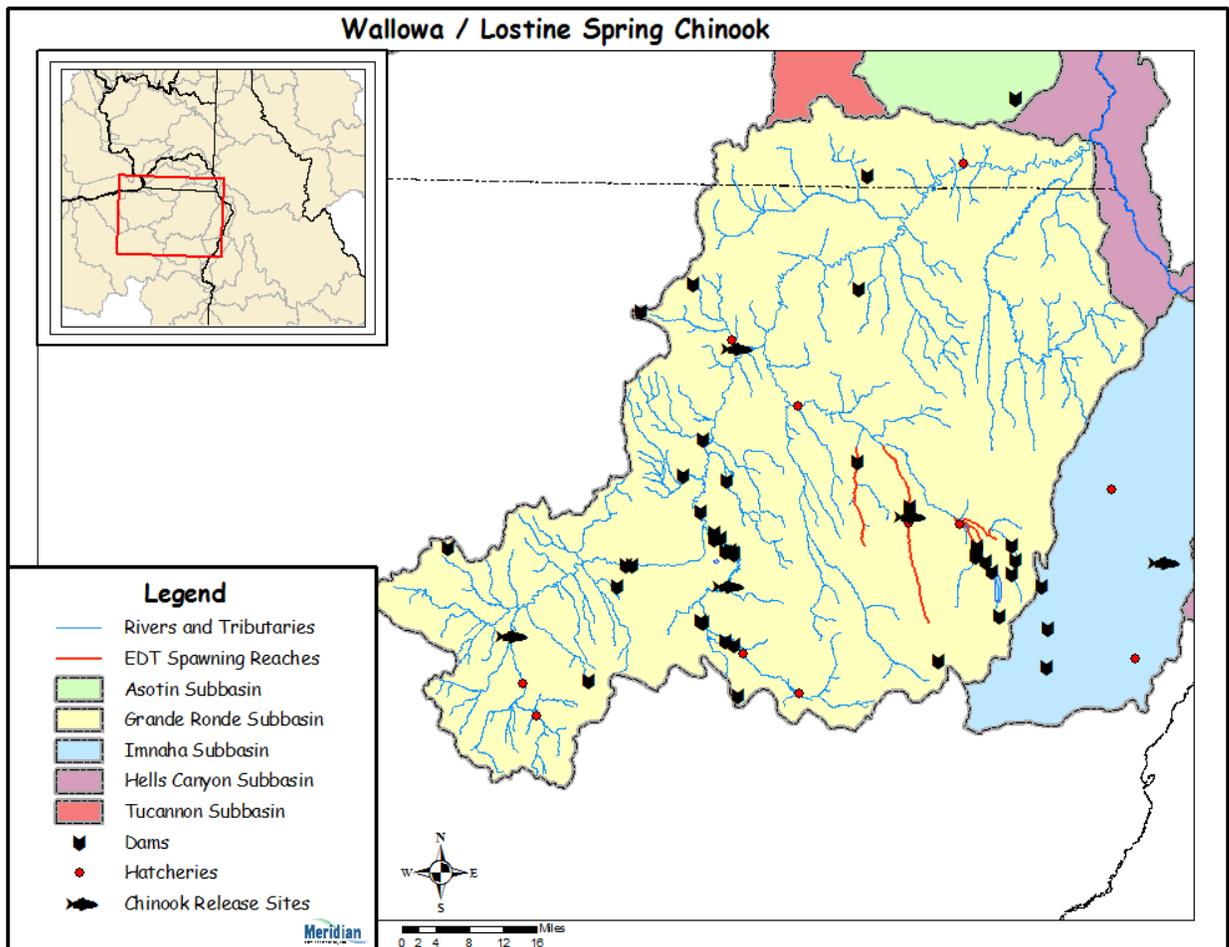
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Lookingglass Creek Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 249.5 | 95% | 0% | 40% | 0.00 | 79 | 1.3 | 339 | 1,155 |
| | | | | | | | | | | |
| No Hatchery | None Both | - | 0% | 0% | 0% | 1.00 | 134 | 2.8 | 20 | - |
| HSRG Solution | Int Both | 325.1 | 50% | 0% | 73% | 0.00 | 113 | 1.3 | 1,425 | 262 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Both | 325.1 | 50% | 0% | 71% | 0.00 | 125 | 1.5 | 1,428 | 262 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Grande Ronde-Wallowa Lostine River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Grande Ronde Wallowa/ Lostine River Spring Chinook

The Grande Ronde Wallowa Lostine River Spring/Summer Chinook salmon population is part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. This ESU has five major population groupings (MPGs), including: Lower Snake River, Grande Ronde/Imnaha, South Fork Salmon River, Middle Fork Salmon River, and the Upper Salmon River group. The ESU contains both spring and summer run Chinook salmon.

The Grande Ronde Wallowa/ Lostine River population is a spring run, and one of seven extant populations in the Grande Ronde/Imnaha River MPG. This population includes Chinook spawning in the Wallowa River, Lostine River, Bear Creek and Hurricane Creek.

The Interior Columbia Technical Recovery Team (ICTRT) has classified this population of Chinook as “Large” in size based on its historic habitat potential. A Large population is one that requires a minimum abundance of 1,000 wild spawners and an intrinsic productivity of 1.6 recruits per spawner (R/S) to be viable at the 5% extinction risk threshold.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to the Grande Ronde Wallowa/ Lostine River is unknown, but was likely in the thousands. Spawning likely took place primarily in the mainstem Grande Ronde Wallowa Lostine River.

2 Current Conditions

Grande Ronde Wallowa Lostine River spring Chinook spawn in the mainstem river and major tributaries such as Hurricane Creek. Population diversity and abundance has likely been reduced due to habitat degradation, harvest, and juvenile and adult mortality associated with passage through the federal Columbia River hydropower system.

According to the ICTRT, historic (1952-2005) abundance of age 3+ spring Chinook for this subbasin has ranged from 37 to 1,463 fish, with a recent 10-year geometric run size of 276. The adult abundance estimate is based on redd counts expanded by 3.2 fish per redd (Beamsderfer et al. 1997). Natural-origin spawners have comprised a total of 85% of total spawners over the last 10 years. Out-of-ESU hatchery strays to the basin averaged approximately 14%. The strays were from the Carson and Rapid rivers. The last release of Rapid River stock occurred in 1990 in Dear and Hurricane creeks.

The Nez Perce Tribe reports that current escapement of age 3+ Lostine River Chinook salmon (natural- and hatchery-origin) from 1997 to 2007 ranged from 100 fish in 1999 to 1,555 fish in 2004. Spawner abundance of age 3+ natural-origin spring Chinook in the Lostine River has ranged from 93 fish (1999) to 400 fish (2001) and comprised from 20.2% (2005) to 100% (1998) of all spawners in the Lostine River. The 11-year geometric mean (1997 to 2007) for natural-origin spawners in the Lostine River is 223. Spawner abundance of hatchery-origin Chinook in the Lostine River is managed at the weir using a sliding scale. A total of 1,585 Chinook salmon were removed from the Lostine River from 1997 to 2007 for broodstock, adult out-plants, harvest, and mortality. Adult hatchery out-plants into the Wallowa River, Hurricane Creek and Bear Creek occurred from 2002 to 2007 and totaled 751 hatchery fish. Productivity, as measured by

progeny per parent ratios from brood years 1997 to 2002, ranged from 4.89 for brood year 1997 to 0.34 for brood year 2002. Natural smolt-to-adult return rates ranged from 1.01% for brood year 2001 to 6.05% for brood year 1998.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for Wallowa/ Lostine Spring Chinook.

- **ESA Status:** Grande Ronde Wallowa Lostine River Spring Chinook population is part of the Snake River Spring/Summer Chinook ESU and is listed as Threatened.
- **Population Description:** The Grande Ronde Wallowa Lostine River population is classified by the ICTRT as “Large.” For the HSRG review, the population has been classified as Primary.
- **Recovery Goal for Abundance:** 1,000 wild spawners
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity:** Productivity: 3.7; Capacity: 1,300

2.2 Current Hatchery Programs Affecting this Population

The Grande Ronde Spring/Summer Chinook Hatchery program may release up to 250,000 juveniles annually, of which 150,000 may be from captive broodstock. The captive brood program is phasing out, with a target production of 62,500 through brood year 2009. Fish are generally released at approximately 20 fpp. All juveniles are marked with adipose fin-clips, coded wire or elastomer tags or a combination of the three; conventional and captive broodstock smolts are differentially marked. Smolts are acclimated at ponds located in the Lostine River beginning in early March. The juveniles are allowed to volitionally emigrate from the ponds starting in late March, but are then forced out in mid-April. No juvenile culling occurs for fish forced from the ponds. Broodstock for the conventional component of the program is collected at a weir located on the Lostine River. Fecundity for female conventional broodstock has averaged 4,426 eggs. Conventional female broodstock are tested for BKD and culling of eggs may occur at high BKD levels. Wild juvenile parr were last collected as broodstock for the captive brood component in 2006. These fish are reared at Manchester Research Labs. Egg-incubation and juvenile rearing occurs at Oxbow Hatchery for the captive component. Both components of the program have an R/S value of 11.00.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated programs: 702 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 10 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural origin adults in

the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.1 to 3.2. Average abundance of natural origin spawners (NOS) would increase from approximately 650 fish to approximately 900 fish. Harvest contribution of the natural and hatchery populations would go from approximately 688 fish to approximately 185 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified both conservation and harvest objectives for this population. Their strategy for Lostine River spring Chinook salmon is meant to maintain existing natural spawning populations as well as use hatchery-origin Chinook salmon in an attempt to augment natural production. Currently this integrated hatchery program is not being operated consistent with the HSRG-defined standards of a Primary population, but is meeting the standards for a Contributing population (pNOB =0.5, pHOS =0.50, PNI = 0.50).

The total production objective for the Lostine Wallowa population is to release 250,000 smolts (20 fpp) derived from anadromous returns, natural-origin returns to the Lostine River and captive broodstock. The program is partial fulfillment of the LSRCP adult return goal of 9,070 adult spring Chinook to the project area. The captive broodstock component is being phased out. Adults for the conventional program are collected at a weir on the Lostine River and held at Lookingglass Hatchery. Gamete fertilization, egg-incubation, and early juvenile rearing occurs at Oxbow Hatchery. Acclimation and release occurs at the Lostine River acclimation site.

The managers are conducting research using parent/progeny genotyping to determine relative reproductive success of natural- vs. hatchery-origin spawners.

Current broodstock management includes outplanting of some excess Lostine River hatchery fish (precocious males) to Bear Creek, Hurricane Creek and the Upper Wallowa River.

All of the genetic information about this population comes from samples collected in the Lostine River, therefore it is unknown if any population substructure exists.

Recommendations

The HSRG recommends that genetic work be completed to determine whether fine-scale structure exists within this population. Under both scenarios described below, outplanting excess hatchery fish should be restricted to vacant or newly-opened habitat.

The HSRG identified two options that would meet the standards of a Primary population. Under one option, the Lostine River component of the population would be managed consistent with a Primary population designation (PNI of 0.67). This solution manages Hurricane Creek and the Wallowa for natural reproduction and the Lostine River for hatchery and natural reproduction. This would require reducing the program to 190,000 smolt release and improving the weir to remove 90% of the unharvested hatchery-origin fish and reducing adult outplants into Hurricane Creek and the Wallowa River. This option also requires selectively harvesting 20% of the hatchery-origin fish in the terminal area.

Under another option, the Lostine River component of the population would be managed consistent with a Contributing population designation (PNI of 0.5), while the Wallowa and Hurricane creeks would be managed for natural production as a hatchery-free area, resulting in a combined PNI of approximately 0.67. This solution manages Hurricane Creek and the Wallowa for natural reproduction and the Lostine River for hatchery and natural reproduction. In developing this solution, we assumed that the Lostine River accounts for 50% of the natural production for this population. This would allow the program to be maintained at its current size (250,000 smolts; pNOB = 0.5) but would require eliminating adult outplants into Hurricane Creek and the Wallowa River and

would depend upon a very low level of straying into those streams. The weir would need to be improved to remove 90% of the unharvested hatchery-origin fish. This option would not require selective harvest to remove hatchery-origin fish. In both solutions we also assumed that adults are being outplanted into vacant habitat to extend the geographic range of the population. If that is not the case, and managers intend to integrate their hatchery program with a population extending beyond the Lostine River component, we recommend that hatchery broodstock should be representative of the expanded population.

The HSRG recommends that managers continue to implement their successful broodstock BKD management strategy, which includes culling.

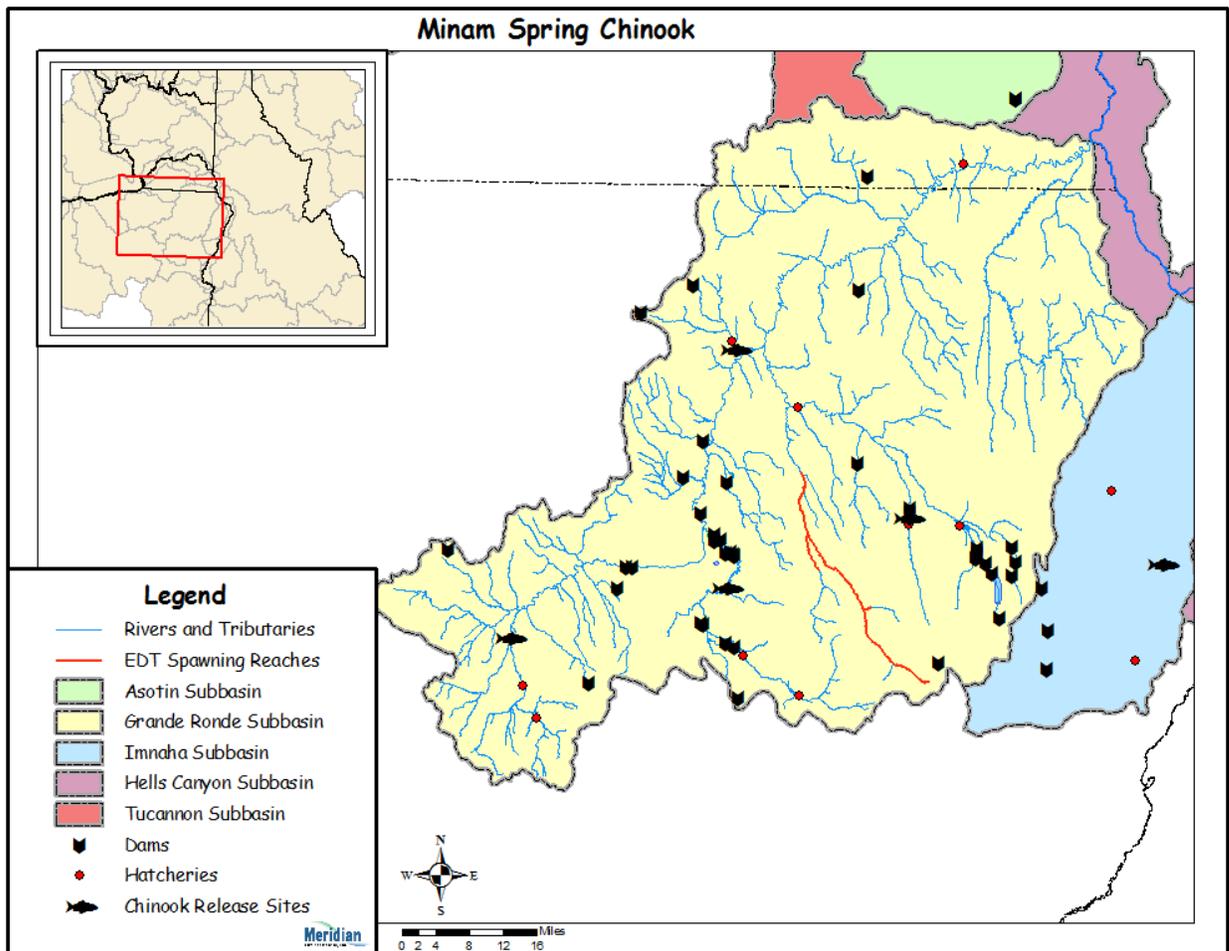
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Wallowa Lostine River Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 249.5 | 55% | 0% | 47% | 0.52 | 653 | 2.1 | 688 | 777 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 891 | 3.2 | 185 | - |
| HSRG Solution | Int Cons | 249.5 | 90% | 0% | 16% | 0.76 | 734 | 2.9 | 733 | 1,397 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 249.5 | 90% | 0% | 14% | 0.78 | 873 | 3.3 | 762 | 1,397 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Grande Ronde-Minam River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Grande Ronde Minam River Spring Chinook

The Grande Ronde Minam River Spring/Summer Chinook population is part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. This ESU has five major population groupings (MPGs), including: Lower Snake River, Grande Ronde/Imnaha, South Fork Salmon River, Middle Fork Salmon River, and the Upper Salmon River group. The ESU contains both spring and summer run Chinook. The Minam River population is a spring run, and is one of seven extant populations in the Grande Ronde/Imnaha River MPG.

The Interior Columbia Technical Recovery Team (ICTRT) has classified this population of Chinook as an “Intermediate” population in size based on its historic habitat potential. An “Intermediate” population is one that requires a minimum abundance of 750 wild spawners and an intrinsic productivity of 1.8 recruits per spawner (R/S) to be viable at the 5% extinction risk threshold.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to the Grande Ronde Minam River is unknown but was likely in the thousands. Spawning likely took place primarily in the mainstem Minam River.

2 Current Conditions

Minam River spring Chinook spawn in the mainstem river and major tributaries such as the Little Minam River. Population diversity and abundance has likely been reduced due to habitat degradation, harvest, and juvenile and adult mortality associated with passage through the federal Columbia River hydropower system.

Recently (1978-2005) the ICTRT reported that the abundance of age 3+ spring Chinook for this subbasin ranged from 54 to 1,446 fish, with a recent 10-year geometric run size of 337 fish. The adult abundance estimate is based on expanded redd counts. Natural-origin spawners have comprised 96% of the total spawners over the last 10 years. Out-of-ESU hatchery strays to the subbasin have averaged approximately 16%. The strays were from the Carson and Rapid rivers, which no longer release fish to the subbasin.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for Minam Spring Chinook.

- **ESA Status:** Grande Ronde Minam River Spring Chinook are part of the Snake River Spring/Summer Chinook ESU.
- **Population Description:** The Grande Ronde Minam River population is classified by the ICTRT as an “Intermediate” population. For the HSRG review, the population has been classified as Primary.
- **Recovery Goal for Abundance:** 750 wild spawners
- **Productivity Improvement Expectation:** 0%. No habitat actions are proposed for the Minam River; however, any improvement in passage survival through the federal Columbia River hydropower system would increase population productivity.
- **Habitat Productivity and Capacity:** Productivity: 5.7; Capacity: 338

2.2 Current Hatchery Programs Affecting this Population

No hatchery programs release fish directly to the Minam River.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated programs: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 17 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.9 to 5.3. Average abundance of natural origin spawners (NOS) would increase from approximately 175 fish to approximately 290 fish. Harvest contribution of the natural population would go from approximately 25 fish to approximately 40 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution

(Recommendations) that appeared to be consistent with manager’s goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Minam River spring Chinook salmon that emphasizes maintaining existing natural spawning populations. Currently this population is consistent with the HSRG-defined standards of a Contributing population (pHOS = 7%). With implementation of HSRG recommendations for other programs, it is estimated that the proportion of hatchery strays spawning with this natural population will be reduced to approximately 4%, consistent with the standards for a Primary population.

Recommendations

The HSRG recommends that managers continue to accurately and precisely monitor status and trend information for this natural population as well as the proportion of hatchery fish in natural production areas.

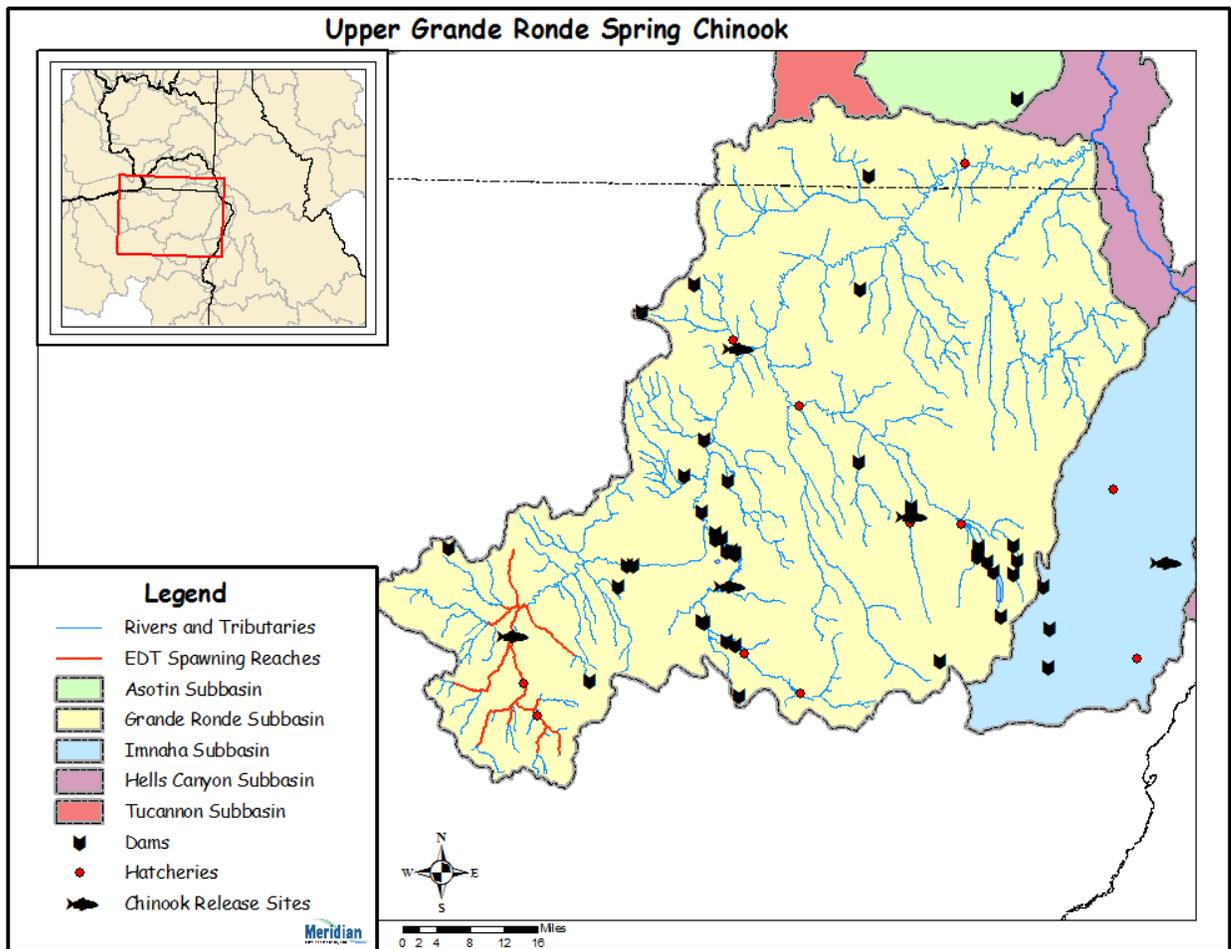
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Minam River Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 7% | 0.00 | 174 | 2.9 | 25 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 287 | 5.3 | 42 | - |
| | | | | | | | | | | |
| HSRG Solution | None None | - | 0% | 0% | 4% | 0.00 | 220 | 3.7 | 32 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 4% | 0.00 | 261 | 4.3 | 38 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Upper Grande Ronde Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Grande Ronde Upper Grande Ronde Spring Chinook

The Grande Ronde Upper Grande Ronde Spring Chinook population is part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. This ESU has five major population groupings (MPGs), including: Lower Snake River, Grande Ronde/Imnaha, South Fork Salmon River, Middle Fork Salmon River, and the Upper Salmon River group. The ESU contains both spring and summer run Chinook.

The Grande Ronde- Upper Grande Ronde population is a spring run, and is one of seven extant populations in the Grande Ronde/Imnaha River MPG. This population includes fish spawning in the Upper Grande Ronde River and Sheep Creek.

The ICTRT has classified this population of Chinook as a “Large” population in size based on its historic habitat potential. A “Large” population is one that requires a minimum abundance of 1,000 wild spawners and an intrinsic productivity of 1.6 recruits per spawner (R/S) to be viable at the 5% extinction risk threshold.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to the Grande Ronde Upper Grande Ronde is unknown, but was likely in the thousands. Spawning likely took place primarily in the mainstem Upper Grande Ronde River.

2 Current Conditions

Upper Grande Ronde spring Chinook spawn in the upper mainstem and in Sheep Creek. Population diversity and abundance has likely been reduced due to habitat degradation, harvest, and juvenile and adult mortality associated with passage through federal Columbia River hydropower system.

Recently (1953-2003), the ICTRT reports that abundance of 3+ spring Chinook for this subbasin has ranged from 3 to 855 fish, with a recent 10-year geometric run size of 38 fish. Natural-origin spawners have comprised a total of 77% of total spawners over the last 10 years. Out-of-ESU hatchery strays to the subbasin have averaged approximately 18%. The strays were primarily from the Carson and Rapid rivers; fish which haven't been released in the subbasin since 1994.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Upper Grande Ronde Spring Chinook.

- **ESA Status:** Upper Grande Ronde Spring Chinook are part of the Snake River Spring/Summer Chinook ESU which is listed as Threatened.
- **Population Description:** The Grande Ronde Upper Grande Ronde population is considered by the ICTRT to be a “Large” population. For the HSRG review, the population has been classified as Stabilizing.
- **Recovery Goal for Abundance:** 1,000 wild spawners
- **Productivity Improvement Expectation:** Increase productivity to achieve the ICTRT R/S value of 1.6.
- **Habitat Productivity and Capacity:** Productivity: 1.0; Capacity: 300

2.2 Current Hatchery Programs Affecting this Population

The Grande Ronde Spring/Summer Chinook hatchery program may release up to 250,000 juveniles each year. The program has both a captive broodstock and conventional program. Fish are generally released at approximately 20 fpp. All juveniles are marked with adipose fin-clips, coded wire or elastomer tags, or a combination of the three. A portion of the fish production is acclimated at raceways located in the subbasin and operated by the CTUIR. Juveniles are allowed to voluntarily emigrate from the raceways starting in late March, but are then forced out in mid-April. Approximately 500 wild juvenile fish are used as broodstock for the captive brood component. These fish were reared at the Manchester Research Station and/or Bonneville Hatchery. The captive brood program is phasing into a safety net approach with juveniles reared to adults at Bonneville Hatchery. Details of the safety net program are not fully developed. Adults for the conventional program are collected at a weir on Upper Grande Ronde and held at Lookingglass Hatchery. Spawning, egg-incubation and early rearing also occurs at this hatchery. Acclimation and release occurs at the Upper Grande Ronde acclimation site. Both components have an R/S value of 5.0.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated programs: 387 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 10 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.4 to 0.9. Average abundance of natural origin spawners (NOS) would decrease from approximately 94 fish to approximately 0 fish. Harvest contribution of the natural and hatchery populations would go from approximately 200 fish to 0 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified both conservation and harvest objectives for this population. Near-term objectives are concentrated on conservation. Their strategy for Upper Grande Ronde spring Chinook salmon is meant to maintain a natural spawning population using captive brood and conventional integrated conservation programs. Currently the integrated conservation program is not being operated consistent with the HSRG-defined standards of a Primary or Contributing population (currently pHOS is 77%, pNOB is 5%, and PNI is 0.06). Based on population productivity and capacity information provided to the HSRG, substantial habitat improvements will be required to support this population. The hatchery program is operating as a safety net and it appears that this population would be extirpated without hatchery intervention. The managers have designed and are implementing sliding scale broodstock protocols that are designed to achieve the standards of a Primary population.

The total production objective for the upper Grande Ronde is to release 250,000 smolts (20 fpp) derived from both anadromous returns and captive broodstock. The program is partial fulfillment of the LSRCP adult return goal of 9,070 adult spring Chinook to the project area. Adults for the conventional program are collected at a weir on Upper Grande Ronde and held at Lookingglass Hatchery. Spawning, egg-incubation and early rearing also occurs at this hatchery. Acclimation and release occurs at the Upper Grande Ronde acclimation site.

While partial adult escapement information is available from a downstream weir, there is a lack of information about this population in their primary spawning location in Vey Meadows.

The captive broodstock has experienced high BKD mortality from sourcing broodstock from juvenile collection. To address this problem, managers have begun sourcing part of the captive broodstock from eggs taken from the conventional program.

There appears to be considerable uncertainty about habitat capacity in various Grande Ronde watersheds. The habitat capacity and productivity provided to the HSRG is currently estimated at 300 adults and 1.0 recruits per spawner, respectively. If accurate, this limited capacity and productivity significantly limits the ability to achieve conservation goals. Cold water at Lookingglass Hatchery may limit the size of fish at release and may have a negative effect on survival.

Recommendations

This program should continue to operate as a safety net until habitat is improved to a point where it can support a natural population. In years when adult escapement is low (e.g., less than 50 fish), managers should incorporate all returning natural-origin adults into the hatchery broodstock. These recommendations are meant to provide an interim conservation strategy until habitat issues are addressed. When population productivity and capacity have increased, the managers will need to develop plans to transition to a properly integrated program (e.g., $PNI \geq 0.50$).

Managers should implement other means to improve the success of the conventional program (and reduce the reliance on the captive brood program) such as (1) evaluating the potential to increase adult returns by releasing larger smolts; (2) sizing acclimation facilities to meet program needs; (3) investigating holding adults destined for natural spawning at the existing acclimation site for release into the natural environment just prior to spawning; (4) injecting adults with antibiotics; (5) using salmon carcasses or carcass analogs for nutrient enhancement; and (6) using another means of identifying the origin of adults other than adipose fin-clipping. Until the conventional program is self-supporting, fish can be released without being marked.

The HSRG recommends that the managers review the existing habitat potential (productivity and capacity) as it will influence the type of program appropriate to the conditions and the contribution the Upper Grande Ronde can make to recovery. In addition, managers should investigate options to improve survival, such as increasing smolt size at release. A plan to increased size at release would need to consider potential changes to biological factors important to natural reproduction of hatchery-origin spawners. However, the advantage of increased survival could be realized by meeting abundance goals while releasing fewer fish and removing fewer natural-origin fish for broodstock.

The HSRG recommends that managers continue to implement their successful broodstock BKD management strategy, which includes culling.

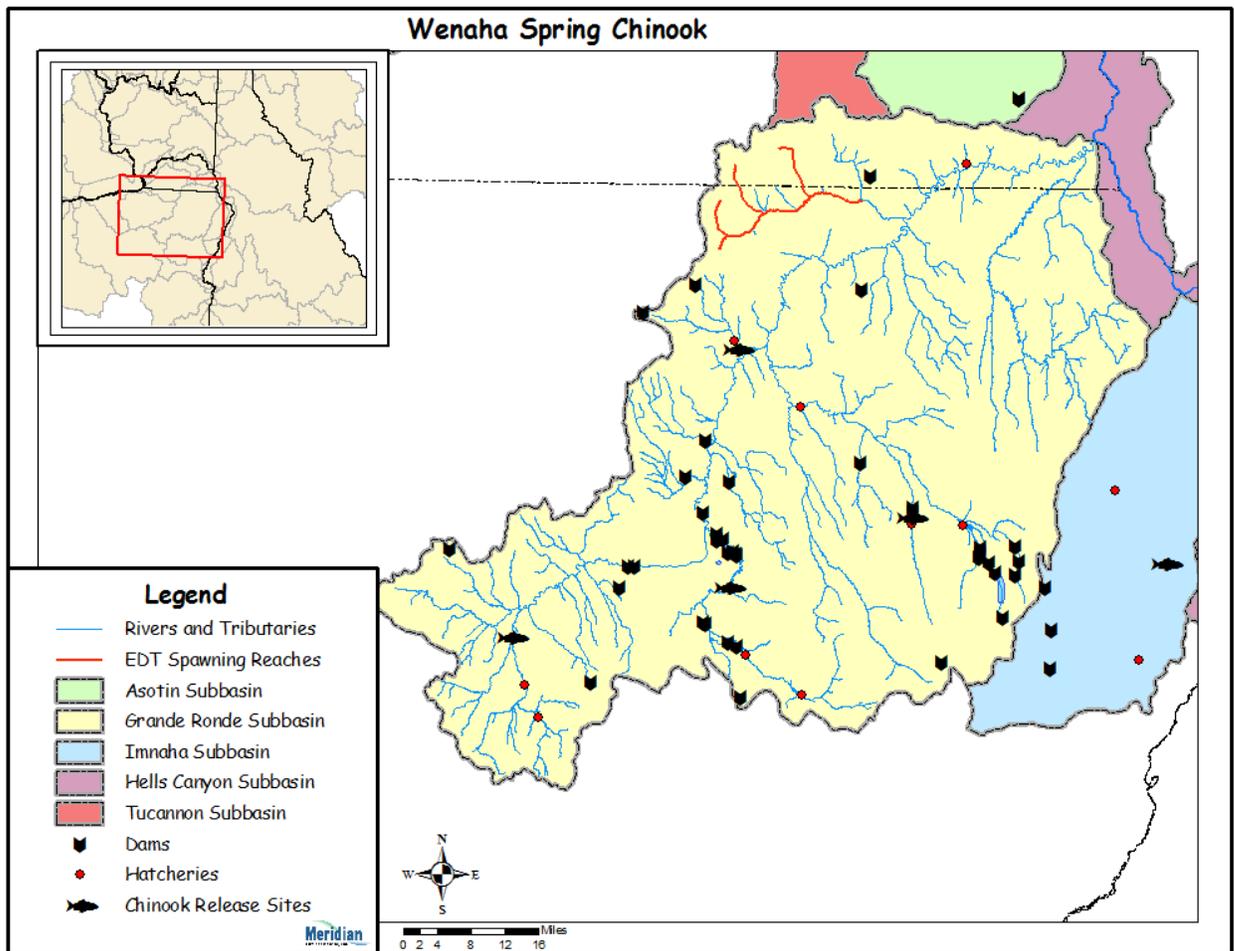
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Upper Grande Ronde Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 251.0 | 50% | 0% | 77% | 0.06 | 94 | 0.4 | 198 | 314 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 0 | 0.9 | 0 | - |
| HSRG Solution | Int Cons | 251.0 | 50% | 0% | 77% | 0.06 | 105 | 0.5 | 144 | 361 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 251.0 | 50% | 0% | 75% | 0.06 | 118 | 0.5 | 146 | 361 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Grande Ronde- Wenaha Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Grande Ronde Wenaha River Spring Chinook

The Grande Ronde Wenaha River Spring/Summer Chinook population is part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. This ESU has five major population groupings (MPGs), including: Lower Snake River, Grande Ronde/Imnaha, South Fork Salmon River, Middle Fork Salmon River, and the Upper Salmon River group. The ESU contains both spring and summer run chinook.

The Wenaha River population is a spring run, and is one of seven extant populations in the Grande Ronde/Imnaha River MPG.

The Interior Columbia Technical Review Team (ICTRT) has classified this population of Chinook as “Intermediate” in size based on its historic habitat potential. An “Intermediate” population is one that requires a minimum abundance of 750 wild spawners and an intrinsic productivity of 1.8 recruits per spawner (R/S) to be viable at the 5% extinction risk threshold.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to the Wenaha River is unknown, but was likely in the thousands. Spawning likely took place primarily in the mainstem Wenaha River, Butte Creek and the North Fork Wenaha.

2 Current Conditions

Wenaha River spring Chinook spawn in the mainstem river and major tributaries such as Butte Creek and North Fork Wenaha. Population diversity and abundance has likely been reduced due to harvest, and juvenile and adult mortality associated with passage through federal Columbia River hydropower system. The vast majority of the Wenaha River lies in wilderness managed by the USFS.

The ICTRT reports that the abundance of 3+ spring Chinook for this subbasin has ranged from 47 to 2,545 fish (1964-2005). Natural-origin spawners have comprised a total of 85% of total spawners since 1964, with this value increasing to 95% in recent years. Out-of-ESU hatchery strays comprised about 23% of the total spawners in the Wenaha River. Most of these strays were from Carson and Rapid River stock which are no longer released in the Grande Ronde River.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for Wenaha Spring Chinook.

- **ESA Status:** Wenaha River Spring Chinook are part of the Snake River Spring/Summer Chinook ESU which is listed as Threatened.
- **Population Description:** The Grande Ronde Wenaha River population is classified by the ICTRT as an “Intermediate” population. For the HSRG review, the population has been classified as Primary.

- Recovery Goal for Abundance: 750 wild spawners
- Productivity Improvement Expectation: 0%. No habitat actions are proposed for the Wenaha River; however, any improvement in passage survival through the federal Columbia River hydropower system would increase population productivity.
- Habitat Productivity and Capacity: Productivity: 5.2; Capacity: 488

2.2 Current Hatchery Programs Affecting this Population

No hatchery programs release fish directly to the Wenaha River.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated programs: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 17 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 3.1 to 4.9. Average abundance of natural origin spawners (NOS) would increase from approximately 275 fish to approximately 400 fish. Harvest contribution of the natural population would go from approximately 40 fish to approximately 60 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Wenaha spring Chinook salmon that emphasizes maintaining the existing natural spawning population. Currently this population is consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05). With implementation of HSRG recommendations for other programs, it is estimated that the proportion of hatchery strays spawning with this natural population will be reduced to approximately 2%.

Recommendations

The HSRG recommends that managers continue to accurately and precisely monitor status and trend information for this natural population as well as the proportion of hatchery fish in natural production areas.

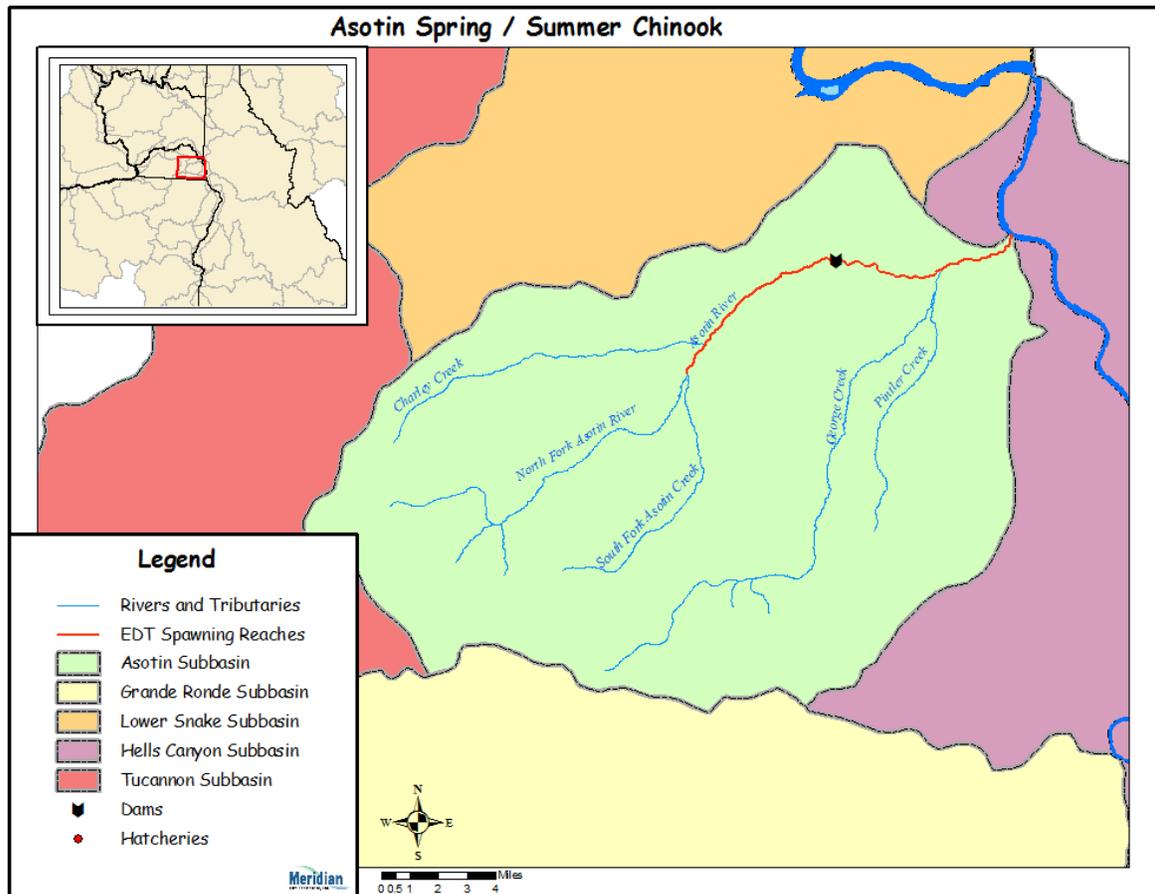
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Wenaha Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 5% | 0.00 | 278 | 3.1 | 41 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 405 | 4.9 | 59 | - |
| HSRG Solution | None None | - | 0% | 0% | 3% | 0.00 | 342 | 3.9 | 50 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 2% | 0.00 | 400 | 4.4 | 59 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Asotin Creek Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Asotin Creek Spring Chinook

The Asotin Creek Spring/Summer Chinook population is part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. This ESU has five major population groupings (MPGs), including: Lower Snake River, Grande Ronde/Imnaha, South Fork Salmon River, Middle Fork Salmon River, and the Upper Salmon River group. The ESU contains both spring and summer run Chinook.

The Asotin population is a spring/summer run, and is one of two historic populations in the Lower Snake River MPG. The other is the Tucannon River population. The Asotin Creek population was recently classified by the Interior Columbia Technical Recovery Team (ICTRT) as functionally extirpated.

The ICTRT has classified this population of Chinook as a “Basic” population in size based on its historic habitat potential. A “Basic” population is one that requires a minimum abundance of 500 wild spawners and an intrinsic productivity greater than 2.3 recruits per spawner (R/S) to be viable at the 5% extinction risk threshold.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to Asotin Creek is unknown, but was likely in the thousands. Spawning likely took place primarily in the mainstem Asotin Creek.

2 Current Conditions

Asotin Creek spring/summer Chinook spawn in the North Fork Asotin Creek. Small numbers of juvenile spring Chinook have been observed in the South Fork and upper mainstem. The Asotin Creek population diversity and abundance has been reduced by in-basin habitat degradation, harvest, and juvenile and adult mortality associated with passage through federal Columbia River hydropower system.

According to the Asotin Creek Subbasin Plan (NPPC 2004) and the Snake River Salmon Recovery Plan for southeast Washington, adult spring Chinook abundance has been less than 10 fish per year. Adult abundance has been at or near zero for several years in the past 15 years. No hatchery spring Chinook are released to the Asotin Creek, although hatchery adult spring Chinook have been documented in the past 3-4 years.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Asotin Creek Spring Chinook.

- ESA Status: Asotin Creek Spring Chinook are part of the Snake River Spring/Summer Chinook ESU.
- Population Description: The Asotin Creek population is classified by the ICTRT as a “Basic” population. For the HSRG review, the population has been classified as Stabilizing.
- Recovery Goal for Abundance: 500 wild spawners
- Productivity Improvement Expectation: 10%

- Habitat Productivity and Capacity: Productivity 2.3; Capacity 467

2.2 Current Hatchery Programs Affecting this Population

No hatchery spring Chinook are currently released to the Asotin River basin.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs : 15

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.1 to 2.1. Average abundance of natural origin spawners (NOS) would increase from approximately 77 fish to approximately 258 fish. Harvest contribution of the natural and hatchery populations would go from approximately 11 fish to approximately 38 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where

applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager’s goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

| |
|---|
| <p>Observations</p> <p>This population is extirpated and managers have plans to reintroduce spring Chinook into this river.</p> <p>Recommendations</p> <p>The HSRG has no specific recommendations for this population.</p> |
|---|

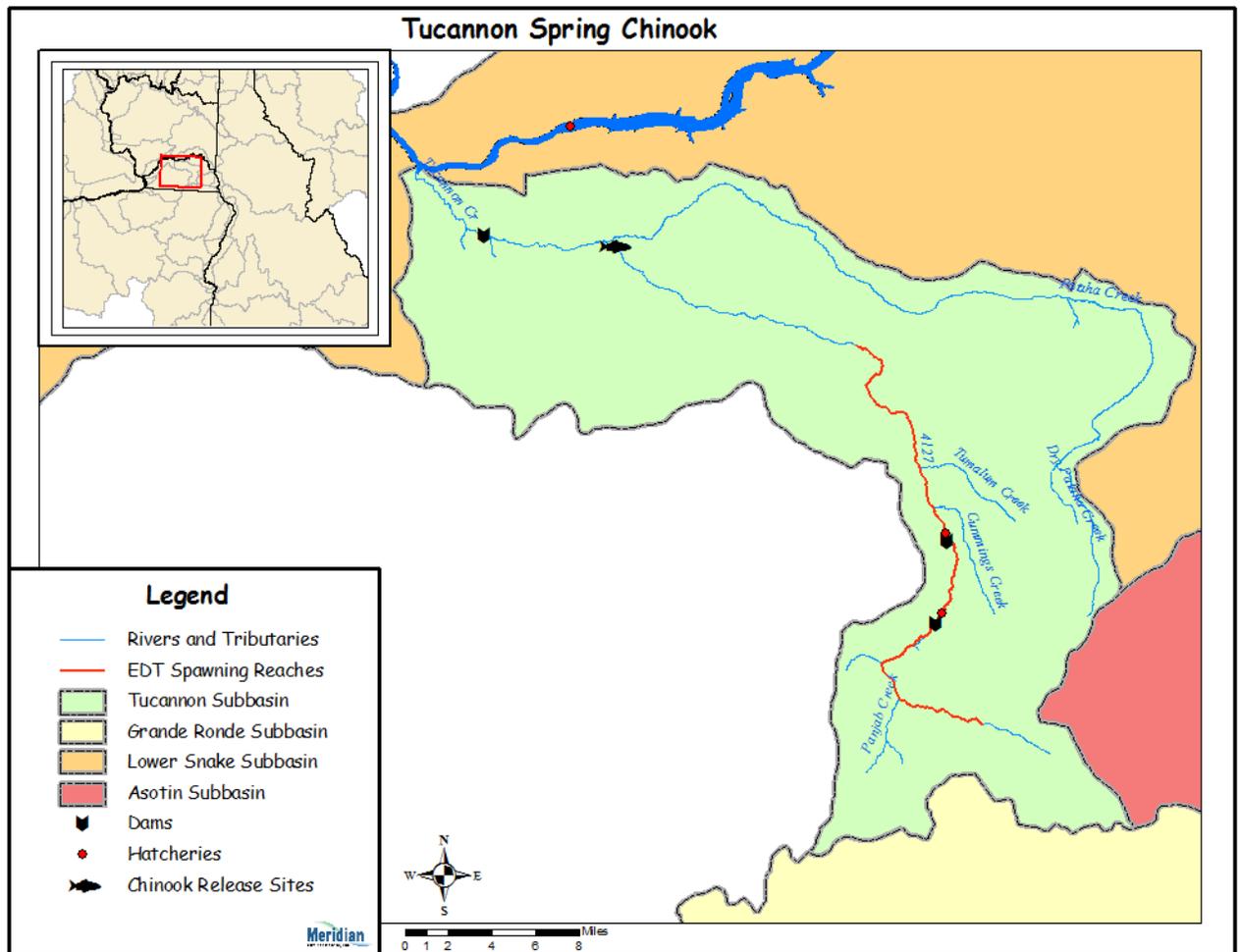
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Asotin Creek Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 14% | 0.00 | 77 | 1.1 | 11 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 258 | 2.1 | 38 | - |
| HSRG Solution | None None | - | 0% | 0% | 3% | 0.00 | 188 | 1.7 | 28 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 2% | 0.00 | 256 | 2.0 | 38 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Tucannon River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Tucannon River Spring Chinook

The Tucannon River Spring/Summer Chinook population is part of the Snake River Spring/Summer Chinook ESU that is classified as threatened under the Endangered Species Act. This ESU has five major population groupings (MPGs), including: Lower Snake River, Grande Ronde/Imnaha, South Fork Salmon River, Middle Fork Salmon River, and the Upper Salmon River group. The ESU contains both spring and summer run Chinook.

The Tucannon population is a spring/summer run, and is one of two historic populations in the Lower Snake River MPG. The other historic population in the Lower Snake MPG is Asotin Creek; recently it was classified by the Interior Columbia Technical Recovery Team (ICTRT) as functionally extirpated.

The ICTRT has classified this population of Chinook as an “Intermediate” population in size based on its historic habitat potential. An “Intermediate” population is one that requires a minimum abundance of 750 wild spawners and an intrinsic productivity of 1.8 recruits per spawner (R/S) to be viable at the 5% extinction risk threshold.

Historically, it is estimated that anywhere from 2-3 million spring/summer Chinook returned to the entire Snake River each year (NPPC 2004). The portion returning to the Tucannon River is unknown, but was likely in the thousands. Spawning likely took place primarily in the mainstem Tucannon River.

2 Current Conditions

Tucannon River spring/summer Chinook typically spawn and rear above RKM 40. Population diversity and abundance has been reduced due to in-basin habitat degradation, harvest, and juvenile and adult mortality associated with passage through federal Columbia River hydropower system.

According to the ICTRT, recent abundance (1979-2003) of 3+ spring Chinook for this subbasin has ranged from 11 to 897 fish¹. Natural spawners include returns from the Lyons Ferry Hatchery supplementation program (which began in 1988), a program that historically used both natural- and hatchery-origin broodstock in a 1:1 ratio. Natural-origin spawners have averaged about 70% of the total adult escapement. Out-of-ESU strays spawning naturally in the basin generally have been less than 5%, with Umatilla River-origin fish making up a large proportion of this value.

The Tucannon Hatchery released approximately 240,000 spring Chinook yearlings to the Tucannon River in 2007 (both captive brood and conventional hatchery production). The captive brood program is being terminated.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for Tucannon Spring Chinook.

- ESA Status: Tucannon River Spring Chinook are part of the Snake River Spring/Summer Chinook ESU.

¹ WDFW staff indicates that abundance values may be too low; however, they were based on NMFS ICTRT analysis.

- Population Description: The Tucannon River population is classified by the ICTRT as an “Intermediate” population. For the HSRG review, the population has been classified as Primary.
- Recovery Goal for Abundance: 750 wild spawners
- Productivity Improvement Expectation: 10%
- Habitat Productivity and Capacity: Productivity 2.2; Capacity 550

2.2 Current Hatchery Programs Affecting this Population

There are two hatchery programs operating within the subbasin that affect the Tucannon spring Chinook population.

1. Tucannon Supplementation Program: This program has a release goal of 130,000 spring Chinook smolts to the Tucannon River. Future plans are to expand total releases to 225,000 smolts. Fish are released at the Tucannon Hatchery in March/April at approximately 15 fpp; however, recent releases have been in 7-8 fpp range. Juveniles are 100% adipose fin-clipped. Broodstock (170) are collected at the Tucannon Fish Hatchery Trap located at RKM 59 on the mainstem Tucannon River. The trap is assumed to have about a 90-95% adult trapping efficiency. Broodstock are transferred to Lyons Ferry Hatchery where they are spawned, the eggs incubated and juveniles reared. Broodstock consists of approximately 50% NOR and 50% HOR adults, depending upon the run. The program has an R/S value of 3.0.

2. A captive brood hatchery program using endemic Tucannon spring Chinook has been operating for several years with the goal of releasing 150,000 smolts per year. This program is being terminated and final returning adults should enter the Tucannon River in 2011.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated programs: 200
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs : 1

According to WDFW staff, Umatilla Hatchery strays have exceeded 8% in several years. Also, PIT tag data indicates that up to 36% of the Tucannon spring Chinook returning adults migrate upstream of Lower Granite Dam. Only with the use of PIT tags in recent years have these fish been accounted for.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would

be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.3 to 2.1. Average abundance of natural origin spawners (NOS) would increase from approximately 184 fish to approximately 291 fish. Harvest contribution of the natural and hatchery populations would go from approximately 88 fish to approximately 41 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Lyons Ferry Hatchery (LFH) and Tucannon Fish Hatchery (TFH) were built/modified under the Lower Snake River Fish and Wildlife Compensation Plan. One objective was to compensate for the estimated annual loss of 1,152-spring Chinook (Tucannon River stock) caused by hydroelectric projects on the Snake River. The standard supplementation production goal is 132,000 fish for release as yearlings at 15 fpp. (Tucannon River Spring Chinook Salmon Hatchery Evaluation Program: 2005 Annual Report, August 2006)

Managers have not assigned a population designation for Tucannon spring Chinook. The HSRG assumed this population should be considered a Primary population. As currently managed, it is not consistent with that designation, having a PNI less than 0.67. Currently this population is meeting the standard for a Contributing population (PNI of 0.54). Beginning with the 2006 brood year the hatchery program release goal will be 225,000 smolts; however, the program currently releases 130,000 smolts. A captive broodstock program has operated in the Tucannon since the

1990s with a release goal of 150,000 smolts. Managers recently terminated this program and final adult returns are expected in 2011. With current habitat capacity and productivity levels, the identified conservation goals for this population are not be achievable. The HSRG questions the contribution the Tucannon can make to recovery of the ESU without substantial habitat improvements in the watershed.

The hatchery program is providing a conservation demographic benefit to the population by reducing extinction risks, but it also poses increased genetic risks to the natural population.

Based on PIT tag information, managers indicated that a substantial portion of adults are bypassing the Tucannon River and have been detected at Lower Granite Dam. Managers also indicated that the spawning distribution of both wild and hatchery fish has shifted downstream. Both of these issues negatively affect the productivity of the population.

Recommendations

The HSRG developed a solution that allows this population to meet the standards of a Primary or a Contributing population. The HSRG recommends that spring Chinook observed at the Lyons Ferry Hatchery outfall be collected and their origin determined. Those identified as Tucannon-origin fish should be incorporated into the existing program. Fish of unknown origin should be returned to the river. In addition, the HSRG recommends developing long-term rearing capabilities within the Tucannon River subbasin.

The HSRG looked at various hatchery scenarios that could improve productivity, but could not significantly increase natural-origin spawning under current habitat conditions. Changes to the current program described below could be implemented to provide additional harvest opportunities and maintain the abundance of natural-origin spawners.

If managed as a Primary population, a program of approximately 100,000 smolts with a 50% pNOB and a pHOS of 25% would be consistent with this designation. For this to be achieved, a minimum of 50% of the hatchery fish returning to the Tucannon River would need to be removed at the weir or by selective terminal harvest.

If managed as a Contributing population, a larger program of approximately 160,000 smolts with a 50% pNOB and a pHOS of 48% would be consistent with this designation. For this to be achieved, a minimum of 50% of the hatchery fish returning to the Tucannon River would need to be removed at the weir or by selective terminal harvest.

Unless habitat improvements occur, it does not appear that planned program size of 225,000 smolts can be achieved and be consistent with the standards of a Primary or Contributing population.

Managers should consider demographic risks to the population and modify their protocols during periods of low abundance. Managers also should develop a variable sliding scale for abundance so that in low abundance years, more of the appropriate stock is allowed to reach the spawning grounds.

An example of such a sliding scale would look like this:

Each year, depending on NOR run size, pNOB and pHOS are allowed to “float” or slide. The HSRG assumes managers will establish an acceptable level of removal of NORs for use in the hatchery brood. This will be a fixed percentage of the total NOR return (say 40%) and will not change, regardless of NOR return. In years of high NOR abundance, this 40% could make up 100% of the needed hatchery brood (pNOB= 100%). In that case, no HORS would be used in the hatchery brood. Hatchery fish can be allowed to reach the spawning ground (pHOS) if needed to achieve an appropriate number of fish spawning naturally (demographic benefit and use of

available habitat). This however, would not be required during years of very high NOR returns as both objectives (pNOB and natural spawning) may be met with NORs.

In years of low NOR abundance, the same 40% of the NOR return would be removed for use in the hatchery brood (pNOB). However, in these years, that 40% may make up only a small part of the needed brood (i.e. pNOB 10%). In these years, enough HORs should be used to achieve needed hatchery brood and additional HORs should be allowed to spawn naturally (pHOS) to achieve the minimum acceptable level of naturally spawning.

The goal of this sliding scale is to achieve an “average” PNI over time of the desired level (0.67 or 0.5) depending on the population designation even though it may not be achieved in any one year. A good way to determine the level of NORs that should be removed each year (see above) is to review the return of NORs over a long time frame and iterate what level (30, 40, 50%) are needed, on average, to achieve the desired PNI.

The managers should investigate ways to address straying of Tucannon Spring Chinook above Lower Granite Dam and the distribution of spawners within the Tucannon watershed.

The HSRG recommends that managers implement a BKD control strategy for their spring and summer/fall Chinook hatchery programs where BKD has proved a recurring problem. Ideally, the strategy should include culling (destroying) eggs/progeny from hatchery- and natural-origin brood that are found to be infected with the BKD agent. However, because brood fish with high levels of the BKD agent are more likely to transmit the agent to their progeny than brood with lesser levels of the agent, the culling of eggs/progeny from infected brood fish, should, at the very least, be applied to those with high levels of the BKD agent (e.g., ELISA OD value of 0.4 and above when broodstock are not in short supply and ELISA OD value of 0.6 and above when broodstock are in short supply). In addition, in programs using ESA-listed natural-origin brood fish, the culling of their eggs/progeny may, at the managers’ discretion, be dispensed with. However, the ESA-listed broodstock should be injected, pre-spawning, with an appropriate antibiotic (preferably, azithromycin at 40 mg/kg fish), and the resulting eggs should be surface-disinfected with an iodophor. All pre-spawning brood injections may be limited to females, ESA-listed or otherwise.

Finally, eggs and hatchlings derived from broodstock found to be heavily infected with the BKD agent should be incubated/reared in isolation from those obtained from broodstock with no or lesser levels of the BKD agent. In addition, the hatchlings should be reared at the lowest possible densities (below current standards), and, at the first signs of infection with the BKD agent, they should be treated with orally administered erythromycin (100 mg/kg fish) for 28 days. The treatment should be repeated if there is evidence that the BKD agent has persisted in the hatchlings.

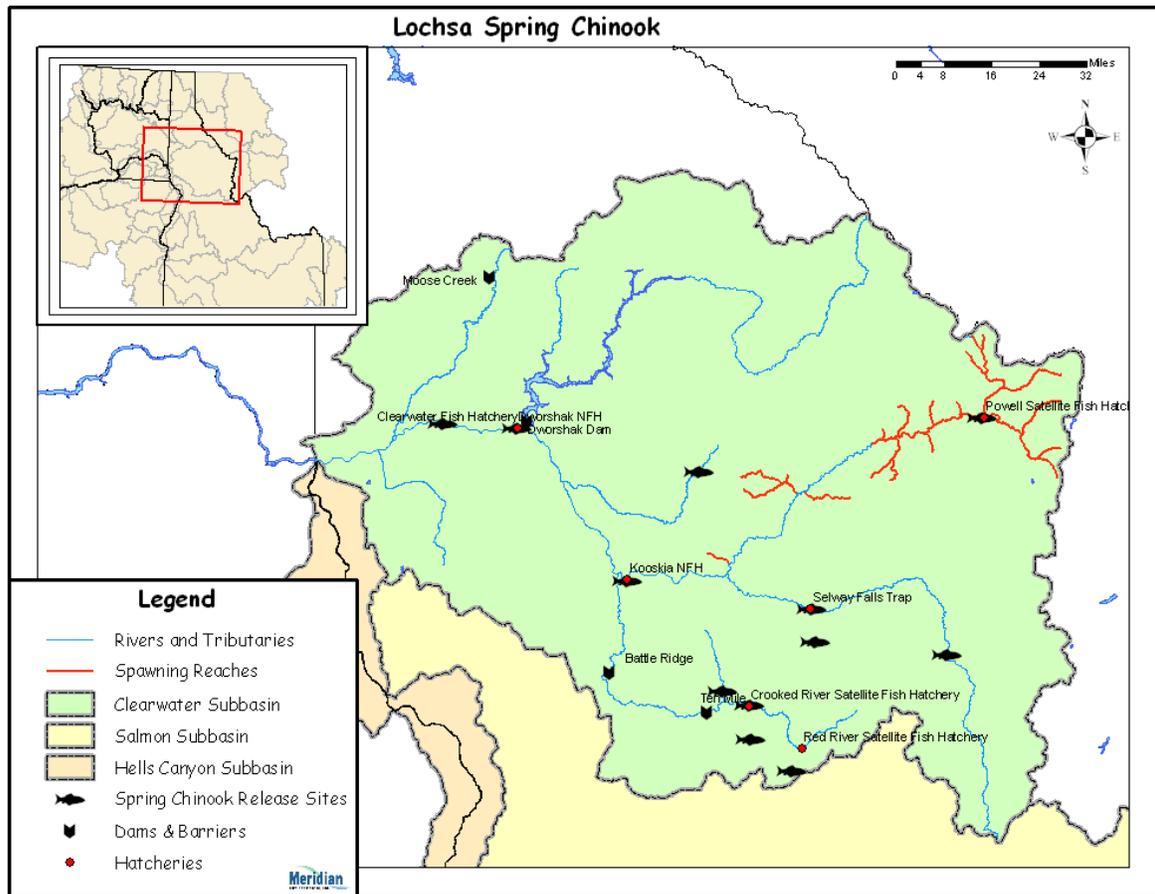
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Tucannon Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 132.6 | 20% | 0% | 47% | 0.52 | 184 | 1.3 | 88 | 12 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 291 | 2.1 | 41 | - |
| HSRG Solution | Int Cons | 163.4 | 50% | 0% | 44% | 0.53 | 167 | 1.4 | 104 | 108 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 163.4 | 50% | 0% | 37% | 0.58 | 226 | 1.7 | 112 | 108 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Lochsa River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Lochsa River Spring Chinook

The Snake River Spring- and Summer-Run ESU was listed as threatened under the Endangered Species Act (ESA) on August 22, 1992 and reaffirmed on June 28, 2005. The ESU includes those fish that spawn in the Snake River drainage and its major tributaries, including the Grande Ronde River and the Salmon River, and that complete their adult upstream migration (passing Bonneville Dam) between March and July. Fifteen artificial propagation programs are also included in the ESU; however, the non-indigenous hatchery spring- and summer-run Chinook stocks currently used in the Clearwater River and its tributaries, including the Lochsa River, are not considered part of the ESU (57 FR 14653).

Spring Chinook salmon were likely extirpated from the Clearwater River subbasin following the construction of Lewiston Dam in 1927. With completion of the Kooskia and Dworshak National Fish Hatcheries (NFH) in 1967 and 1969, millions of spring Chinook were released into the Clearwater River and its tributaries, primarily as yearling smolts. Broodstock for these hatcheries came primarily from the Rapid River Hatchery (considered an upper Snake River stock), with significant contributions from Carson-stock hatcheries (Leavenworth, Little White Salmon, and Carson NFHs) and Willamette River hatcheries. More recently, these and other facilities in the basin have used adults returning to the hatcheries or satellite collection sites to supply gametes for their programs (Myers et al. 1998). The total adult return goal for Dworshak NFH and Clearwater Fish Hatchery is 21,135 spring Chinook over Lower Granite Dam. Currently Kooskia NFH and the Nez Perce Tribal Hatchery do not have established adult return goals.

Spring Chinook salmon enter the Columbia River and begin spawning migrations during April and May, reaching the Clearwater subbasin from April through July (Nez Perce Tribe and IDFG 1990). Spawning typically occurs in tributaries and headwater streams in August and September. Eggs hatch in December with emergence complete by April. Spring Chinook salmon remain in fresh water for one year, migrating to the ocean in the spring of their second year, typically from March through June. Nearly all adult spring and summer Chinook that return to the Snake River Basin result from fish that emigrate as yearlings in April-May.

There are no estimates of historical spring Chinook run sizes in the Lochsa River. Chapman (1981) estimated that the Lochsa River system was capable of producing 459,000 spring Chinook smolts in its pristine condition.

2 Current Conditions

Adult spring Chinook returns to the Lochsa River consist primarily of hatchery-origin fish. The Lochsa River Spring Chinook population is not listed under the ESA. A Clearwater Fish Hatchery satellite facility (Powell) is located at the headwaters of the Lochsa River at the confluence of Brushy Fork Creek and Colt Killed Creek. Reintroduction of spring Chinook salmon following removal of the Lewiston Dam in 1973 has resulted in naturally reproducing runs in mainstem and tributary reaches of the Lochsa River. Primary spawning tributaries include Bear (Papoose), Big Flat, Brushy Fork, Colt Killed, Crooked Fork, Fishing (Squaw), and Pete King creeks. The number of natural-origin adults spawning in natural production areas is unknown for this population.

The number of juvenile Chinook released at Powell has ranged from a low of 500 fish in 1991 to a high of 909,520 fish in 2000. The adult return goal for the Powell satellite is

2,553 adults to the project area upstream of Lower Granite Dam. Total adult returns to Powell (hatchery- and natural-origin combined) have ranged from a low of 14 fish in 1995 to 2,344 fish in 2001 (for the period 1995 through 2006).

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 211 and 0.60, respectively. The model also estimates that 366 hatchery origin Chinook stray into this population each year. The vast majority of strays come from the segregated program operating out of the Powell satellite facility.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** The non-indigenous spring- and summer-run stocks currently used in the Clearwater River subbasin are not considered part of the Snake River Spring- and Summer-Run ESU, and are not listed under the ESA (57 FR 14653).
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Stabilizing. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** Not listed, no goal
- **Productivity Improvement Expectation:** NA
- **Habitat Productivity and Capacity:** Productivity: 1.3; Capacity: 940

2.2 Current Hatchery Programs Affecting this Population

The primary hatchery program affecting this population is the Clearwater Fish Hatchery spring Chinook segregated harvest program. The purpose of this program is harvest mitigation. Spring Chinook salmon in the Clearwater River subbasin are not ESA-listed, and the program was not intended to enhance or benefit the survival of listed spring Chinook.

Approximately 1,860 Chinook are needed for broodstock for the Clearwater Fish Hatchery spring Chinook salmon program. This number includes 1,020 for Powell, 840 for the South Fork program (Crooked and Red rivers) and also accounts for pre-spawning mortality. The adult return goal for the LSRCP-funded Clearwater Chinook program is 11,915 adult Chinook over Lower Granite Dam.

This program releases approximately 400,000 smolts to the Lochsa River from Powell Pond. In addition, the program may release approximately 300,000 acclimated pre-smolts from the same facility. Smolts and pre-smolts are 100% adipose fin-clipped and a portion coded wire and PIT-tagged. Adult collection occurs from May to August at the Powell satellite. Adults are trucked back to the Clearwater Fish Hatchery for holding. Spawning, incubation and rearing takes place at Clearwater Fish Hatchery. The R/S for the smolt program is 6.00. The R/S for the pre-smolt program is 1.25.

In 1991, the IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study. The study, designed to continue through 2014, incorporates treatment and control streams in the Clearwater and Salmon subbasins. Within this ICTRT population zone, the Chinook supplementation study maintains the following control and treatment streams: Control: Pete King Creek, Crooked Fork Creek, and Brushy Fork Creek; Treatment: Legendary Bear Creek, Fishing Creek, Colt Killed Creek, and Big Flat Creek. “Treatments” include the development and

release of “supplementation” smolts (hatchery x natural parents) and the release of “supplementation” adults to treatment spawning streams (50:50 hatchery: natural-origin release design). In 2004, juvenile treatments ended in all but three study streams and in 2007, adult treatments ended. The study will conclude in 2014 following a five-year period of “no treatment” evaluation.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 366

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.2. Average abundance of natural-origin spawners (NOS) would decrease from approximately 211 fish to approximately 139 fish. The harvest contribution of the natural and hatchery populations would go from approximately 1,041 fish to approximately 22 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where

applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Lochsa River Spring Chinook that emphasizes maintaining existing natural spawning populations and existing hatchery mitigation programs. Currently this population does not meet the HSRG-defined standards for a Primary or Contributing population (PHOS exceeds 0.1).

The LSRCP mitigation goal for Dworshak National and Clearwater fish hatcheries is 9,135 and 11,915 adult spring Chinook to the project area upstream of Lower Granite Dam. The Powell satellite return objective is 2,553 adults to the project area (part of the Clearwater hatchery goal of 11,915). Currently Kooskia NFH and the Nez Perce Tribal Hatchery do not have established adult return goals.

A segregated harvest program operates in the Lochsa River. Approximately 400,000 smolts and 300,000 pre-smolts are released annually from the Powell satellite facility. Beginning in 2009, the 300,000 pre-smolt program will be terminated and 700,000 smolts will be released from this facility. Adults are collected at Powell for spawning at the Clearwater Fish Hatchery. When broodstock collection goals are not achieved here, broodstock is taken from the South Fork Clearwater River program and occasionally from Rapid River in the Salmon River. All fish are adipose fin-clipped and a portion coded wire- and PIT-tagged.

The ongoing Idaho Supplementation Study is ending in 2014. Adult returns from this program ended in 2007. The current phase of the study monitors production and productivity in the absence of adult supplementation. Following 2014, managers will have greater flexibility to pursue other management options.

Recommendations

The HSRG recommends that broodstock for this segregated program originate only from returns to the Lochsa River and that the importation of broodstock from other sources be terminated to promote local adaption and increase productivity of the hatchery program.

The managers should coordinate the programming of all salmon populations reared in the Clearwater Fish Hatchery, Dworshak National Fish Hatchery, Kooskia National Fish Hatchery and Nez Perce Tribal Hatchery to maximize the benefits of available water supply, appropriate water temperature, and rearing containers. Operating these four major hatcheries as a coordinated system would facilitate the movement of programs/populations between and among the different hatcheries. This would maximize survival by producing fish in good condition for release at the appropriate life stage.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Lochsa Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable.

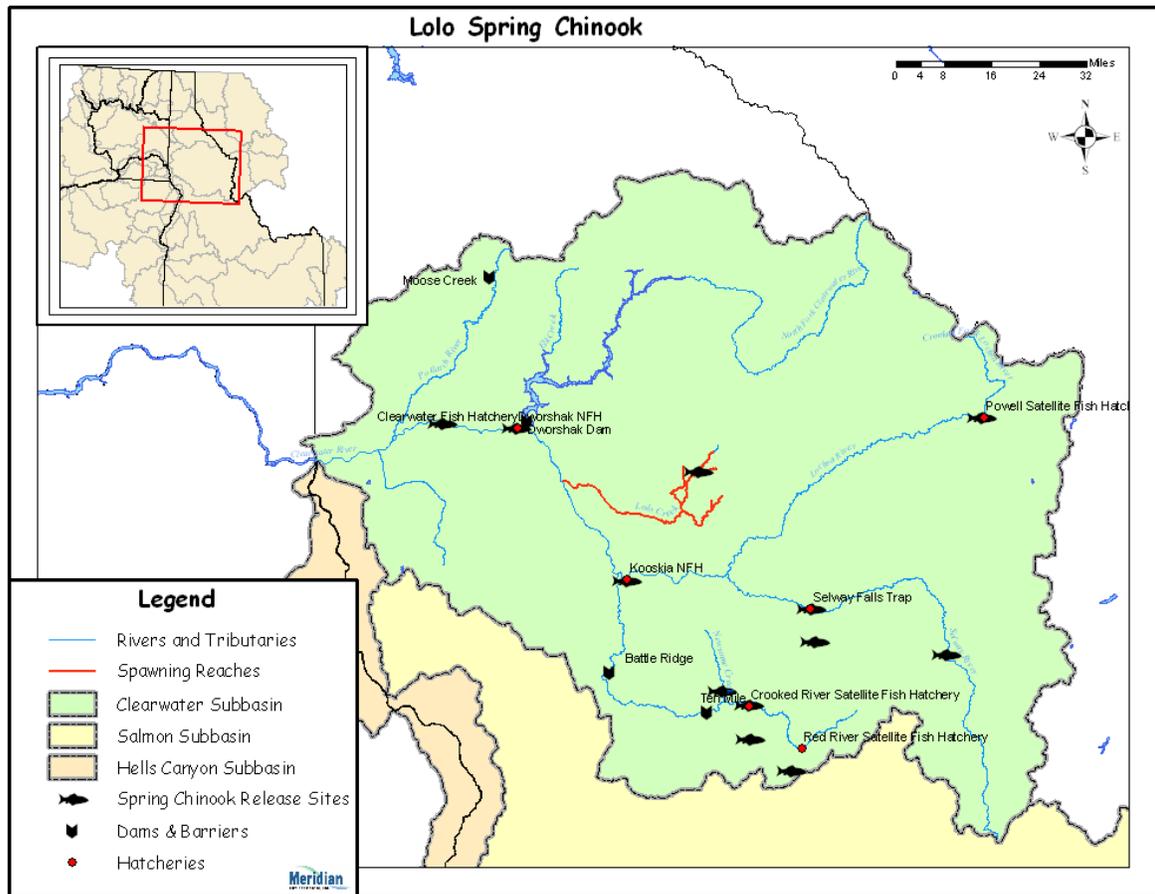
A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 58% | 0.00 | 211 | 0.6 | 34 | 0 |
| | Seg Harv | 700.8 | 80% | | | | | | 1,007 | 668 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 139 | 1.2 | 22 | - |
| HSRG Solution | None None | - | 0% | 0% | 57% | 0.00 | 232 | 0.6 | 38 | 0 |
| | Seg Harv | 700.8 | 80% | | | | | | 1,061 | 746 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 54% | 0.00 | 264 | 0.7 | 43 | 0 |
| | Seg Harv | 700.8 | 80% | | | | | | 1,061 | 746 |

Hatchery Scientific Review Group Review and Recommendations

Lolo Creek Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Lolo Creek Spring Chinook

The Snake River Spring- and Summer-Run ESU was listed as threatened under the Endangered Species Act (ESA) on August 22, 1992 and reaffirmed on June 28, 2005. The ESU includes those fish that spawn in the Snake River drainage and its major tributaries, including the Grande Ronde and the Salmon Rivers, and that complete their adult upstream migration (passing Bonneville Dam) between March and July. Fifteen artificial propagation programs are also included in the ESU; however, the non-indigenous hatchery spring- and summer-run Chinook stocks currently used in the Clearwater River and its tributaries, including the Lochsa River, are not considered part of the ESU (57 FR 14653).

Spring Chinook salmon were likely extirpated from the Clearwater River subbasin following the construction of Lewiston Dam in 1927. With construction of the Kooskia and Dworshak National Fish Hatcheries (NFHs) in 1967 and 1969, millions of spring Chinook were released into the Clearwater River and its tributaries, primarily as yearling smolts. Broodstock for these hatcheries came primarily from the Rapid River Hatchery (considered an upper Snake River stock), with significant contributions from Carson-stock hatcheries (Leavenworth, Little White Salmon, and Carson NFHs) and Willamette River hatcheries. More recently, these and other facilities in the basin have used adults returning to the hatcheries or satellite collection sites to supply gametes for their programs (Myers et al. 1998). The total adult return goal for Dworshak NFH and Clearwater Fish Hatchery is 21,135 spring Chinook over Lower Granite Dam. Currently Kooskia NFH and the Nez Perce Tribal Hatchery do not have established adult return goals.

Spring Chinook salmon enter the Columbia River and begin spawning migrations during April and May, reaching the Clearwater subbasin from April through July (Nez Perce Tribe and IDFG 1990). Spawning typically occurs in tributaries and headwater streams in August and September. Eggs hatch in December with emergence complete by April. Spring Chinook salmon remain in fresh water for one year, migrating to the ocean in the spring of their second year, typically from March through June. Nearly all adult spring and summer Chinook that return to the Snake River Basin result from fish that emigrate as yearlings in April-May.

Historically, Lolo Creek was a significant producer of spring Chinook salmon in the Clearwater River subbasin; however, estimates of historical run size are not available. Chapman (1981) estimated that Lolo Creek was capable of producing 84,000 spring Chinook smolts in its pristine condition.

2 Current Conditions

Adult spring/summer Chinook returns to Lolo Creek consist primarily of hatchery-origin fish resulting from a hatchery program operating at the Nez Perce Tribal Hatchery. The Lolo Creek hatchery-origin population is not listed under the ESA. The reintroduced spring Chinook population in Lolo Creek was originally derived from the Rapid River and other hatchery stocks reared and released at Nez Perce Tribal Hatchery. The current program is now maintained with Lolo Creek returns (to the extent possible). The majority of the natural spawning occurs within the mainstem of Lolo Creek from White Creek to Dutchman Creek; some minor spawning has occurred in the Eldorado Creek to White Creek mainstem segment.

Spawning ground surveys on two major index areas in Lolo Creek above the Musselshell/Lolo confluence showed natural spring Chinook production has fluctuated over the last 14 years. The total number of spring Chinook redds observed in the Lolo Creek drainage for the 1988-2001 spawning periods ranged from 6 redds in 1995 to 501 in 2001. During 1996, 2000 and 2001, the number of spring Chinook redds increased substantially due to an adult out-planting effort by the Nez Perce Tribe. From 2003 through 2007, adult spring Chinook returns to Lolo Creek (as enumerated at two adult weirs) averaged 331 fish, ranging from 672 in 2003 to 89 fish in 2007 (Nez Perce Tribe 2007).

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 75 and 0.60, respectively. The model also estimates that nine hatchery origin Chinook stray into this population each year.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** The non-indigenous spring- and summer-run stocks currently used in the Clearwater River subbasin are not considered part of the Snake River Spring- and Summer-Run ESU, and are not listed under the ESA (57 FR 14653).
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for a Stabilizing population designation.
- **Recovery Goal for Abundance:** Not listed, no goal.
- **Productivity Improvement Expectation:** NA
- **Habitat Productivity and Capacity:** Productivity: 1.3; Capacity: 1,500

2.2 Current Hatchery Programs Affecting this Population

Approximately 750 spring Chinook salmon adults are needed for broodstock for the Nez Perce Tribal Hatchery spring Chinook program. This number includes jacks and accounts for pre-spawning mortality. This brood level will provide for a target release of 75,000 pre-smolts from Newsome Creek (South Fork Clearwater River) acclimation facility, 150,000 pre-smolts from Yoosa/Camp (Lolo Creek) acclimation facilities and 400,000 parr into Meadow Creek (Selway River).

The primary hatchery program affecting the Lolo Creek population is the program operated by the Nez Perce Tribe in Lolo Creek. This program releases approximately 150,000 pre-smolts into Lolo Creek (following acclimation at the Yoosa/Camp ponds). Juveniles are not adipose fin-clipped. All pre-smolts are coded wire-tagged and about 9,000 are PIT-tagged for evaluation purposes.

Adults are collected at one of two weir sites in Lolo Creek. Generally, the number of adults that return to Lolo Creek does not meet broodstock needs; therefore, broodstock may be met with fish from other locations (e.g., Dworshak NFH). Locally trapped fish are held at the Yoosa/Camp satellite facilities until water temperatures reach elevated levels and require the transfer of fish to the Nez Perce Tribal Hatchery. Spawning, incubation, and rearing takes place at the Cherry Lane facility (Nez Perce Tribal Hatchery). The composition of adults in the broodstock as well as spawning in the habitat is unknown. The program has an R/S value of 1.0.

In 1991, the IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study. The study, designed to continue through 2014, incorporates treatment and control streams in the Clearwater and Salmon subbasins. Within this ICTRT population zone, the Chinook Supplementation Study maintains Lolo Creek as a treatment stream and Eldorado Creek as a control stream. “Treatments” include the development and release of “supplementation” smolts (hatchery x natural parents) and the release of “supplementation” adults to treatment spawning streams (50:50 hatchery: natural-origin release design). In 2004, juvenile treatments ended in all but three ISS study streams, and in 2007, adult treatments ended. The study will conclude in 2014 following a five-year period of “no treatment” evaluation.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 52
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: nine

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.2. Average abundance of natural-origin spawners (NOS) would increase from approximately 75 fish to approximately 294 fish.

The harvest contribution of the natural and hatchery populations would go from approximately 20 fish to approximately 32 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Lolo Creek Spring Chinook that emphasizes maintaining existing natural spawning populations, and using hatchery-origin Chinook salmon in an attempt to augment natural production. Currently this population does not meet the HSRG-defined standards for a Primary or Contributing population (pHOS exceeds 0.1).

The hatchery program operating in Lolo Creek has a production goal of 150,000 pre-smolts. Broodstock are trapped at Yoosa/Camp satellites in the Lolo Creek drainage. Adults are held locally until rising water temperatures require their transfer to the Nez Perce Tribal Hatchery near Cherry Lane. Spawning, incubation and rearing takes place at the Nez Perce Tribal hatchery. Pre-smolts are transferred to acclimation ponds in the Lolo Creek drainage in the fall where they rear for volitional release in October. Pre-smolts are 100% coded wire-tagged and about 9,000 are PIT-tagged.

The HSRG acknowledges that managing for the recommended PNI values may not be possible or appropriate when abundance levels are low and demographic risks to the population increase. To address this concern, it is the HSRG's understanding that managers have developed a variable sliding scale for managing abundance so that in low abundance years, more hatchery-origin fish of the appropriate population component are allowed to reach the spawning grounds to reduce demographic risk to the respective populations.

The ongoing Idaho Supplementation Study is ending in 2014. Adult returns from this program ended in 2007. The current phase of the study monitors production and productivity in the absence of adult supplementation. Following 2014, managers will have greater flexibility to pursue other management options.

Recommendations

The HSRG recommends converting the current pre-smolt program to a smolt program of approximately 100,000 fish with a pNOB of 100% and a PNI of 0.67. All hatchery adults would be allowed to spawn naturally. This is expected to result in an average pHOS of 50%. This approach will increase the total spawners as well as natural-origin spawners via reproduction by hatchery-origin recruits in Lolo Creek. In the long term, this approach will provide additional fish for harvest.

The managers should coordinate the programming of all salmon populations reared in the Clearwater Fish Hatchery, Dworshak National Fish Hatchery, Kooskia National Fish Hatchery and Nez Perce Tribal Hatchery to maximize the benefits of available water supply, appropriate

water temperature, and rearing containers. Operating these four major hatcheries as a coordinated system would facilitate the movement of programs/populations between and among the different hatcheries. This would maximize survival by producing fish in good condition for release at the appropriate life stage.

The HSRG also recommends that managers continue to implement their apparently successful BKD risk management strategies, which include culling.

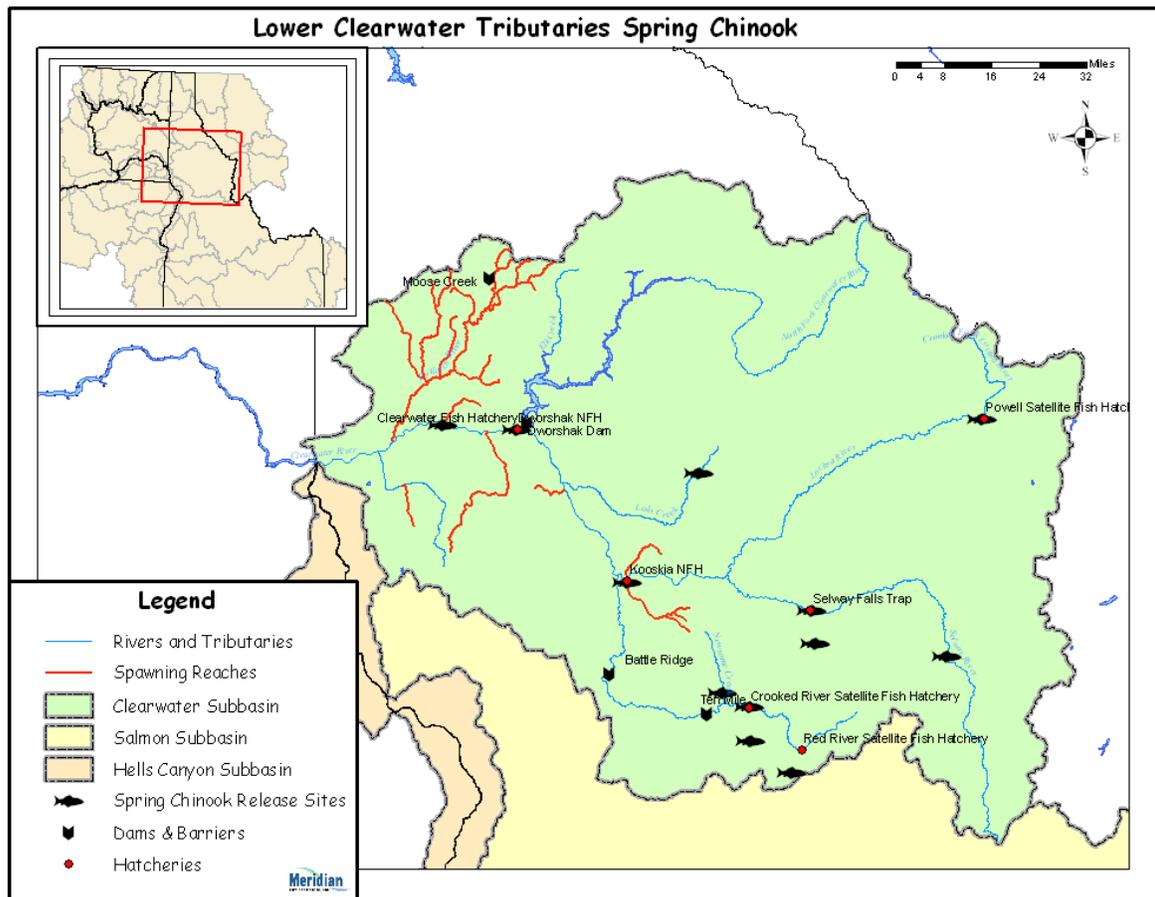
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Lolo Creek Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 148.8 | 50% | 0% | 39% | 0.00 | 75 | 0.6 | 20 | 9 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 294 | 1.2 | 32 | - |
| HSRG Solution | Int Both | 99.7 | 0% | 0% | 39% | 0.72 | 415 | 1.1 | 89 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Both | 99.7 | 0% | 0% | 33% | 0.75 | 536 | 1.2 | 102 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Lower Clearwater River Tributaries Spring Chinook and Related Hatchery Programs

January 31, 2009



1 Lower Clearwater River Tributaries Spring Chinook

The Snake River Spring- and Summer-Run ESU was listed as threatened under the Endangered Species Act (ESA) on August 22, 1992 and reaffirmed on June 28, 2005. The ESU includes those fish that spawn in the Snake River drainage and its major tributaries, including the Grande Ronde River and the Salmon River, and that complete their adult, upstream migration (passing Bonneville Dam) between March and July. Fifteen artificial propagation programs are also included in the ESU; however, the non-indigenous hatchery spring- and summer-run Chinook stocks currently used in the Clearwater River and its tributaries, including the Lochsa River, are not considered part of the ESU (57 FR 14653).

Spring Chinook salmon were likely extirpated from the Clearwater River subbasin following the construction of Lewiston Dam in 1927. After construction of the Kooskia and Dworshak National Fish Hatcheries (NFHs) in 1967 and 1969, millions of spring Chinook were released into the Clearwater River and its tributaries, primarily as yearling smolts. Broodstock for these hatcheries came primarily from the Rapid River Hatchery (considered an upper Snake River stock), with significant contributions from Carson-stock hatcheries (Leavenworth, Little White Salmon, and Carson NFHs) and Willamette River hatcheries. More recently, these and other facilities in the basin have used adults returning to the hatcheries or satellite collection sites to supply gametes for their programs (Myers et al. 1998). The total adult return goal for Dworshak NFH and Clearwater Fish Hatchery is 21,135 spring Chinook over Lower Granite Dam. Currently Kooskia NFH and the Nez Perce Tribal Hatchery do not have established adult return goals.

Spring Chinook salmon enter the Columbia River and begin spawning migrations during April and May, reaching the Clearwater subbasin from April through July (Nez Perce Tribe and IDFG 1990). Spawning typically occurs in tributaries and headwater streams in August and September. Eggs hatch in December, with emergence complete by April. Spring Chinook salmon remain in fresh water for one year, migrating to the ocean in the spring of their second year, typically from March through June. Nearly all adult spring and summer Chinook that return to the Snake River Basin result from fish that emigrate as yearlings in April-May.

There are no estimates of historical spring Chinook run sizes in the Lower Clearwater River tributaries.

2 Current Conditions

This population includes all naturally spawning spring Chinook in the Middle Fork Clearwater River and tributaries, the North Fork Clearwater River downstream of Dworshak Reservoir, and the mainstem Clearwater River and tributaries downstream of the Middle Fork/South Fork confluence, with the exception of the Lolo Creek drainage. Spring Chinook of the Lower Clearwater River tributaries are not listed under the ESA. Current natural abundance (the number of adults spawning in natural production areas) is unknown.

Adult spring Chinook returning to the North Fork Clearwater River are primarily hatchery-origin fish, as Dworshak Dam blocks all passage into the North Fork watershed. There is currently a segregated spring Chinook hatchery program operated at the Dworshak NFH. The stock used in the program was originally derived from the Rapid River (considered an upper Snake River stock) and other hatchery stocks reared and

released at Dworshak NFH. Generally, since 1988 Dworshak NFH has generated its own broodstock from rack returns. Between 2002 and 2006, an average of 4,324 spring Chinook returned to Dworshak (including sport and Tribal harvest).

Adult spring Chinook returns to the Middle Fork Clearwater River consist almost exclusively of hatchery-origin fish. A segregated hatchery program operates out of the Kooskia NFH (located about 1.5 miles east of Kooskia, Idaho, near the confluence of Clear Creek and the Middle Fork Clearwater River). The Kooskia spring Chinook program was started using a wide variety of stocks from the lower Columbia River and Rapid River Hatchery; however, from 1973 through 1980, smolt releases had a very strong Carson stock influence. Egg transfers of Carson stock from Dworshak NFH in 1985 and 1986 resulted in smolt releases in 1987 and 1988 that were a mixed stock, referred to as Clearwater stock. Since the Kooskia NFH program already had stock made up primarily of Carson derivatives, the resultant program (1989 and later) still has a Carson lineage, but is referred to as Kooskia stock. The Kooskia stock is now maintained with Middle Fork Clearwater returns. Between 2002 and 2006, an average of 1,405 spring Chinook returned to the Kooskia NFH (including sport and Tribal harvest).

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 116 and 0.60, respectively. The model also estimates that 496 hatchery origin Chinook stray into this population each year. Hatchery-origin strays are generated primarily from the segregated programs operating at Clearwater and Kooskia National Fish Hatcheries.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** The non-indigenous spring- and summer-run stocks currently used in the Clearwater River subbasin are not considered part of the Snake River Spring- and Summer-Run ESU, and not listed under the ESA (57 FR 14653).
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Stabilizing. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** Not listed, not applicable
- **Productivity Improvement Expectation:** NA
- **Habitat Productivity and Capacity:** Productivity: 1.3; Capacity: 250

2.2 Current Hatchery Programs Affecting this Population

Four hatchery programs potentially affect this population (Dworshak NFH, Kooskia NFH, Clearwater Fish Hatchery, and the Nez Perce Tribal Hatchery).

The Dworshak NFH operates a segregated harvest program in the North Fork Clearwater River. Broodstock collections occur at the hatchery rack from May to August. Returning adults swim up the fish ladder at Dworshak Dam directly into holding ponds. Spawning, incubation, and rearing all take place at Dworshak NFH. This program volitionally releases approximately 1,050,000 smolts (20 fpp) directly to the Clearwater River (on-station release). All smolts are 100% adipose fin-clipped with a portion coded wire- and PIT-tagged. The program has an R/S value of 7.0.

The Kooskia NFH segregated program releases approximately 600,000 smolts into Clear Creek (on-station release), a tributary to the Middle Fork Clearwater River. Adult

salmon are trapped at the Kooskia facility from May through August, and transported to Dworshak NFH for spawning. Rearing occurs at the Kooskia facility. All smolts released are 100% adipose fin-clipped and a portion coded wire- and PIT-tagged for evaluation purposes. The program has an R/S value of 7.0.

The Clearwater Fish Hatchery is located on the lower North Fork Clearwater River across the North Fork from the Dworshak NFH. This program produces spring Chinook salmon to meet segregated harvest mitigation as well as integrated supplementation objectives. Broodstock are collected at satellite facilities in the upper Lochsa River (Powell) and upper South Fork Clearwater (Crooked River and Red River). All spring Chinook produced at the Clearwater Fish Hatchery are released outside of this population zone. Release sites include locations in the South Fork Clearwater River, South Fork Clearwater River tributaries, and the Selway River.

The Nez Perce Tribal Hatchery releases juvenile spring Chinook salmon directly from their facility near Cherry Lane. The spring Chinook production target for the Tribal Hatchery is 124,000 smolts. All other Nez Perce Tribe Chinook salmon releases in the Clearwater occur outside this population zone. Release sites include locations in Newsome Creek, Lolo Creek, and Meadow Creek (Selway). Broodstock are collected at the Tribal Hatchery in addition to locations in Lolo Creek and Newsome Creek. The Nez Perce Tribal Hatchery program has an R/S of 4.2.

Estimated number of hatchery strays affecting the overall population:

- Hatchery strays from integrated in-basin programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 496

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.2. Average abundance of natural-origin spawners (NOS) would decrease from approximately 116 fish to approximately 49 fish. The harvest contribution of the natural and hatchery populations would go from approximately 3,955 fish to approximately 5 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Lower Clearwater River Spring Chinook that emphasizes maintaining existing natural spawning populations, maintaining existing hatchery mitigation programs, and using hatchery-origin Chinook salmon in an attempt to augment natural production. Currently this population does not meet the HSRG-defined standards for a Primary or Contributing population (pHOS exceeds 0.1).

The LSRCP mitigation goal for Dworshak National and Clearwater fish hatcheries is 9,135 and 11,915 adult spring Chinook to the project area upstream of Lower Granite Dam. Currently Kooskia NFH and the Nez Perce Tribal Hatchery do not have established adult return goals.

Four hatchery programs operate in this population zone:

The Dworshak National Fish Hatchery (NFH) operates a segregated harvest program in the North Fork Clearwater River. Broodstock collections occur at the hatchery rack from May through August. Spawning, incubation, and rearing takes place at the Dworshak facility. This program volitionally releases approximately 1,050,000 smolts directly to the Clearwater River. All smolts are 100% adipose fin-clipped with a portion coded wire- and PIT-tagged for evaluation purposes. Most of the water supply for this hatchery is pumped from the North Fork Clearwater River near the adult collection intake, causing reoccurring disease problems at the facility.

The Kooskia NFH segregated program volitionally releases approximately 600,000 smolts annually into Clear Creek, a tributary to the Middle Fork Clearwater River. Adult salmon are trapped at the Kooskia facility from May through August, and transported to Dworshak NFH for spawning. Rearing occurs at the Kooskia facility. All smolts are 100% adipose fin-clipped and a portion coded wire- and PIT-tagged for evaluation purposes. Constraints in surface water quality and groundwater quantity limit program capacity, although winter and spring flows are not limiting. This facility therefore would appear to provide a location for acclimation and release.

The Clearwater Fish Hatchery produces spring Chinook to meet segregated harvest mitigation as well as augmentation/supplementation objectives. Broodstock are collected at satellite facilities in the upper Lochsa River (Powell) and upper South Fork Clearwater (Crooked River and Red River). All spring Chinook produced at the Clearwater Fish Hatchery are released outside this population zone. Release sites include locations in the South Fork Clearwater River, South Fork Clearwater River tributaries, and the Selway River.

The Nez Perce Tribal Hatchery releases juvenile spring Chinook salmon directly from their facility near Cherry Lane. The production target for this program is 200,000 smolts. All other Nez Perce Tribe Chinook salmon releases in the Clearwater subbasin occur outside of this population zone. Release sites include Newsome Creek, Lolo Creek, and Meadow Creek (Selway). Broodstock are collected at the Tribal Hatchery in addition to locations in Lolo Creek and Newsome Creek. This facility has limited water supply and vessels for rearing of yearling fish.

The HSRG acknowledges that managing for the recommended PNI values may not be possible or appropriate when abundance levels are low and demographic risks to the population increase. To address this concern, it is the HSRG's understanding that managers have developed a variable sliding scale for managing abundance so that in low abundance years, more hatchery-origin fish of the appropriate population component are allowed to reach the spawning grounds to reduce demographic risk to the respective populations.

The ongoing Idaho Supplementation Study is ending in 2014. Adult returns from this program ended in 2007. The current phase of the study monitors production and productivity in the absence of adult supplementation. Following 2014, managers will have greater flexibility to pursue other management options.

Recommendations

The managers should coordinate the programming of all salmon populations reared in the Clearwater Fish Hatchery, Dworshak National Fish Hatchery, Kooskia National Fish Hatchery and Nez Perce Tribal Hatchery to maximize the benefits of available water supply, appropriate water temperature, and rearing containers. Operating these four major hatcheries as a coordinated system would facilitate the movement of programs/populations between and among the different hatcheries. This would maximize survival by producing fish in good condition for release at the appropriate life stage.

Kooskia National Fish Hatchery: The HSRG recommends that managers consider modifying the program to match the existing water supply with consideration for supporting other programs within the Clearwater subbasin.

Dworshak National Fish Hatchery: The HSRG recommends that managers develop an improved water supply at this facility to address disease and temperature problems.

Nez Perce Tribal Hatchery: Facility programming should be designed to fit the limitations of the water supply and be integrated with other facilities in the basin to achieve manager's goals.

The HSRG also recommends that managers continue to implement their apparently successful BKD risk management strategies, which include culling.

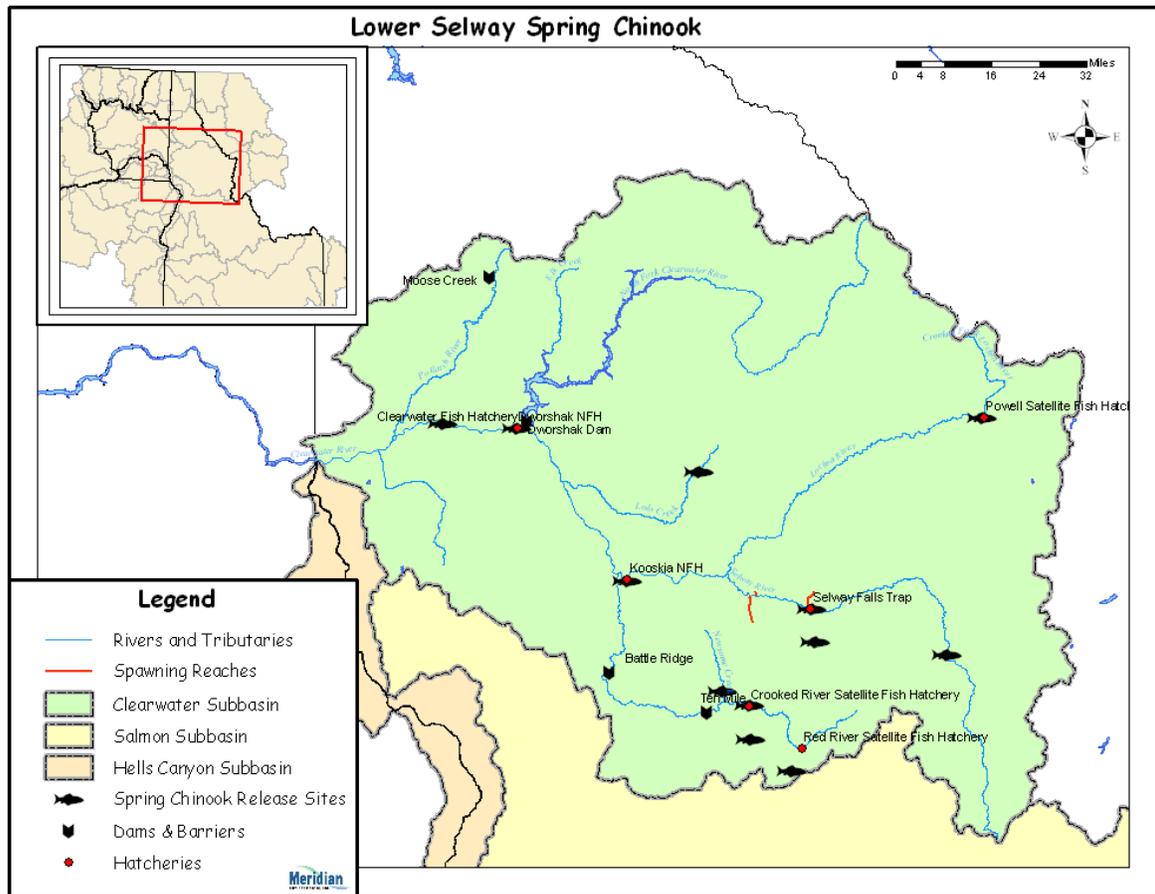
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Lower Clearwater Tributaries Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|----------------------------|------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 77% | 0.00 | 116 | 0.6 | 13 | 0 |
| | NPTH Seg Harv | 124.6 | 90% | | | | | | 84 | 16 |
| | Kooskia Seg Harv | 600.7 | 90% | | | | | | 1,403 | 1,250 |
| | Dworshak-Hatchery Seg Harv | 1,051.1 | 90% | | | | | | 2,455 | 1,687 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 49 | 1.2 | 5 | - |
| HSRG Solution | None None | - | 0% | 0% | 77% | 0.00 | 124 | 0.6 | 14 | 0 |
| | NPTH Seg Harv | 124.6 | 90% | | | | | | 89 | 20 |
| | Kooskia Seg Harv | 600.7 | 90% | | | | | | 1,477 | 1,337 |
| | Dworshak-Hatchery Seg Harv | 1,051.1 | 90% | | | | | | 2,585 | 1,839 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 75% | 0.00 | 138 | 0.7 | 15 | 0 |
| | NPTH Seg Harv | 124.6 | 90% | | | | | | 89 | 20 |
| | Kooskia Seg Harv | 600.7 | 90% | | | | | | 1,477 | 1,337 |
| | Dworshak-Hatchery Seg Harv | 1,051.1 | 90% | | | | | | 2,585 | 1,839 |

Hatchery Scientific Review Group Review and Recommendations

Lower Selway River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Lower Selway River Spring Chinook

The Snake River Spring- and Summer-Run ESU was listed as threatened under the Endangered Species Act (ESA) on August 22, 1992 and reaffirmed on June 28, 2005. The ESU includes those fish that spawn in the Snake River drainage and its major tributaries, including the Grande Ronde River and the Salmon River, and that complete their adult, upstream migration (passing Bonneville Dam) between March and July. Fifteen artificial propagation programs are also included in the ESU; however, the non-indigenous hatchery spring- and summer-run Chinook stocks currently used in the Clearwater River and its tributaries, including the Selway River, are not considered part of the ESU (57 FR 14653).

Spring Chinook salmon were likely extirpated from the Clearwater River subbasin following the construction of Lewiston Dam in 1927. When Kooskia and Dworshak National Fish Hatcheries (NFHs) began operation in 1967 and 1969, millions of spring Chinook were released into the Clearwater River and its tributaries, primarily as yearling smolts. Broodstock for these hatcheries came primarily from the Rapid River Hatchery (considered an upper Snake River stock), with significant contributions from Carson-stock hatcheries (Leavenworth, Little White Salmon, and Carson NFHs) and Willamette River hatcheries. More recently, these and other facilities in the subbasin have used adults returning to the hatcheries or satellite collection sites to supply gametes for their programs (Myers et al. 1998). The total adult return goal for Dworshak NFH and Clearwater Fish Hatchery is 21,135 spring Chinook over Lower Granite Dam. Currently Kooskia NFH and the Nez Perce Tribal Hatchery do not have established adult return goals.

Spring Chinook salmon enter the Columbia River and begin spawning migrations during April and May, reaching the Clearwater subbasin from April through July. Spawning typically occurs in tributaries and headwater streams in August and September. Eggs hatch in December with emergence complete by April. Spring Chinook salmon remain in fresh water for one year, migrating to the ocean in the spring of their second year, typically from March through June. Nearly all adult spring and summer Chinook that return to the Snake River Basin result from fish that emigrate as yearlings in April-May.

2 Current Conditions

Adult spring/summer Chinook returns to the lower Selway River consist primarily of hatchery-origin fish, resulting from a hatchery program operated by the Nez Perce Tribe with cooperation from IDFG and the Clearwater Fish Hatchery. The reintroduced spring Chinook population in the lower Selway River was originally derived from the Rapid River Hatchery, with significant contributions from Carson-stock hatcheries (Leavenworth, Little White Salmon, and Carson NFHs) and Willamette River hatcheries. This composite population is now supplemented with Selway River natural returns. The lower Selway River population area is defined as the mainstem Selway and tributaries downstream of Running Creek. Releases are concentrated around the confluence of Meadow Creek with the Selway River. Spring Chinook of the lower Selway River are not listed under the ESA.

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 178 and 0.60, respectively. The model also estimates that 500 hatchery origin Chinook stray into this population each year.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** The non-indigenous spring- and summer-run stocks currently used in the Clearwater River subbasin are not considered part of the Snake River Spring- and Summer-Run ESU, and are not listed under the ESA (57 FR 14653).
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Contributing. The population currently meets the broodstock criteria for a Stabilizing population designation.
- **Recovery Goal for Abundance:** Not listed, not applicable
- **Productivity Improvement Expectation:** NA
- **Habitat Productivity and Capacity:** Productivity: 1.3; Capacity: 400

2.2 Current Hatchery Programs Affecting this Population

Hatchery programs affecting this population operate out of the Clearwater Fish Hatchery and Nez Perce Tribal Hatchery.

The Nez Perce Tribe releases approximately 300,000 smolts annually to the lower Selway River in the vicinity of Meadow Creek. Broodstock for this release are sourced from South Fork Clearwater hatchery-origin returns. Spawning, incubation, and rearing occur at the Clearwater Fish Hatchery. Approximately 67% of this release group is adipose fin-clipped. All smolts are coded wire-tagged and approximately 8,500 are PIT-tagged. The program has an R/S value of 3.17.

In addition to the lower Selway releases described above, the Nez Perce Tribe has a planning objective to release up to 400,000 parr (117 fpp) in Meadow Creek, a tributary to the lower Selway. Adult collection and spawning occurs at Nez Perce Tribal Hatchery from May through June. Additional broodstock are sourced from returns to the Dworshak NFH. Spawning, incubation, and rearing through release occur at the Nez Perce Tribal Hatchery. Parr are not adipose fin-clipped but all production is coded wire-tagged. The program has an R/S value of 0.70.

In 1991, the IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study designed to continue through 2014. The study incorporates treatment and control streams in the Clearwater and Salmon subbasins. Within this ICTRT population zone, Whitecap Creek, a tributary to the upper Selway River is maintained as a control stream. “Treatments” include the development and release of “supplementation” smolts (hatchery x natural parents) and the release of “supplementation” adults to treatment spawning streams (50:50 hatchery: natural-origin release design). In 2004, juvenile treatments ended in all but three study streams, and in 2007, adult treatments ended. The study will conclude in 2014 following a five-year period of “no treatment” evaluation.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 190
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 500

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.2. Average abundance of natural-origin spawners (NOS) would decrease from approximately 178 fish to approximately 78 fish. The harvest contribution of the natural and hatchery populations would go from approximately 263 fish to approximately 9 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Lower Selway River Spring Chinook that emphasizes maintaining existing natural spawning populations, and using hatchery-origin Chinook salmon in an attempt to augment natural production. Currently this population does not meet the standards for a Primary or Contributing population (pHOS greater than 10%).

Two hatchery programs operate within the lower Selway spring Chinook population group. The first is a smolt program designed to release approximately 300,000 smolts to the lower Selway River near the mouth of Meadow Creek. Broodstock for this release is sourced from South Fork Clearwater returns. Spawning, incubation, and rearing occur at the Clearwater Fish Hatchery. Approximately 67% of this release group is adipose fin-clipped. All smolts are coded wire-tagged and approximately 8,500 are PIT-tagged. Currently there is no ability to control the composition of spawners in the habitat.

The second program has an objective to release up to 400,000 parr (117 fpp) to Meadow Creek, a lower Selway River tributary. This release objective has not been consistently met. Broodstock for this release are sourced from Nez Perce Tribal Hatchery returns as well as Dworshak NFH returns. Spawning, incubation, and rearing through release occur at the Nez Perce Tribal Hatchery. Parr are not adipose fin-clipped, but all production is coded wire-tagged. There is currently no ability to control the composition of spawners in the habitat.

The ongoing Idaho Supplementation Study is ending in 2014. Adult returns from this program ended in 2007. The current phase of the study monitors production and productivity in the absence of adult supplementation. Following 2014, managers will have greater flexibility to pursue other management options.

Recommendations

Goals for this program need to be clarified. As stated, managers have identified conservation as well as harvest goals. Operation of the current hatchery program in the lower river is inconsistent with achieving the conservation goal unless returns from the hatchery program can be managed on spawning grounds. If managers place emphasis in the harvest objective, continuing current operations would be consistent with the HSRG-defined standards of a Stabilizing population.

The managers should coordinate the programming of all salmon populations reared in the Clearwater Fish Hatchery, Dworshak National Fish Hatchery, Kooskia National Fish Hatchery and Nez Perce Tribal Hatchery to maximize the benefits of available water supply, appropriate water temperature, and rearing containers. Operating these four major hatcheries as a coordinated system would facilitate the movement of programs/populations between and among the different hatcheries. This would maximize survival by producing fish in good condition for release at the appropriate life stage.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

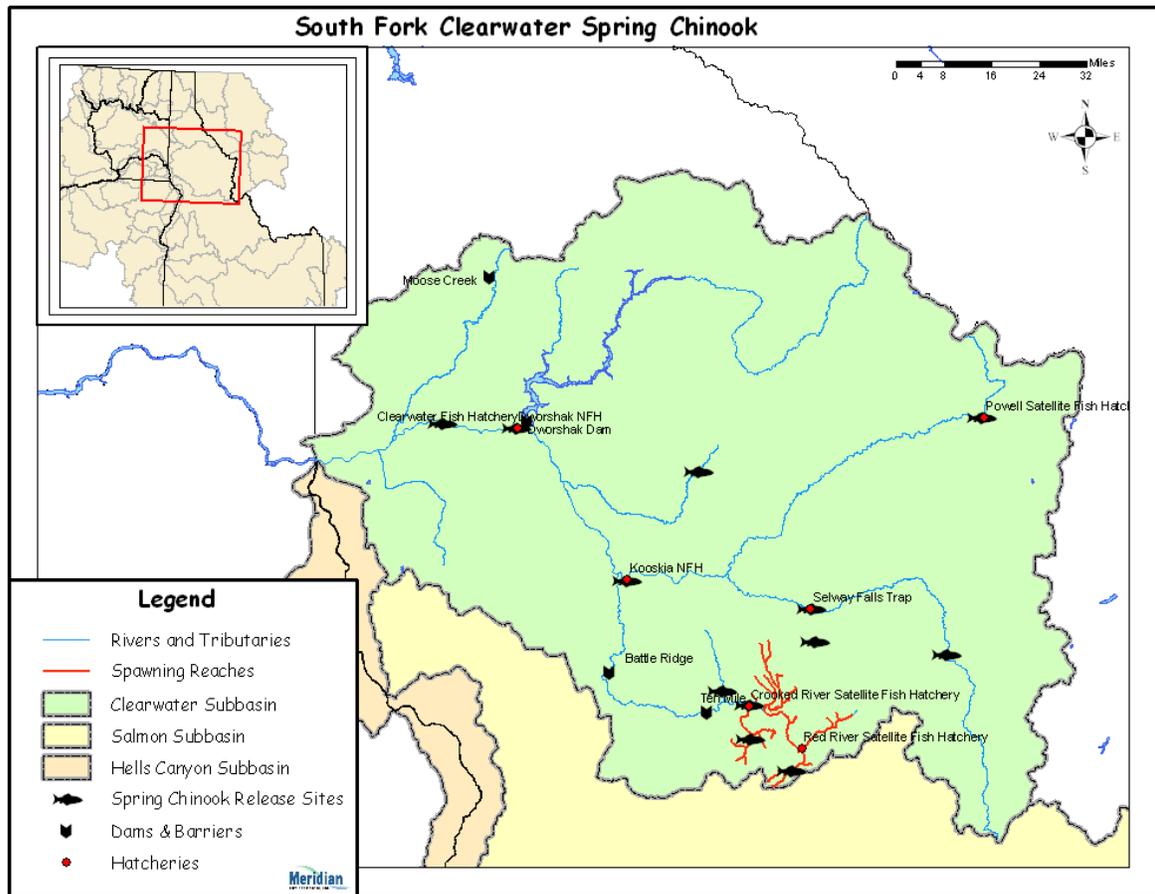
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Lower Selway Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 429.8 | 0% | 0% | 76% | 0.00 | 178 | 0.6 | 40 | 1 |
| | Seg Harv | 300.3 | 0% | | | | | | 223 | 0 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 78 | 1.2 | 9 | - |
| HSRG Solution | Int Both | 429.8 | 0% | 0% | 75% | 0.00 | 191 | 0.6 | 43 | 1 |
| | Seg Harv | 300.3 | 0% | | | | | | 235 | 1 |
| HSRG Solution w/ Improved Habitat | Int Both | 429.8 | 0% | 0% | 73% | 0.00 | 212 | 0.7 | 45 | 1 |
| | Seg Harv | 300.3 | 0% | | | | | | 235 | 1 |

Hatchery Scientific Review Group Review and Recommendations

South Fork Clearwater River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 South Fork Clearwater River Spring Chinook

The Snake River Spring- and Summer-Run ESU was listed as threatened under the Endangered Species Act (ESA) on August 22, 1992 and reaffirmed on June 28, 2005. The ESU includes those fish that spawn in the Snake River drainage and its major tributaries, including the Grande Ronde and Salmon rivers, and that complete their adult, upstream migration (passing Bonneville Dam) between March and July. Fifteen artificial propagation programs are also included in the ESU; however, the non-indigenous hatchery spring- and summer-run Chinook stocks currently used in the Clearwater River and its tributaries, including the South Fork Clearwater, are not considered part of the ESU (57 FR 14653).

Spring Chinook salmon were likely extirpated from the Clearwater River subbasin following the construction of Lewiston Dam in 1927. With construction of the Kooskia and Dworshak National Fish Hatcheries (NFHs) in 1967 and 1969, millions of spring Chinook were released into the Clearwater River and its tributaries, primarily as yearling smolts. Broodstock for these hatcheries came primarily from the Rapid River Hatchery (considered an upper Snake River stock), with significant contributions from Carson-stock hatcheries (Leavenworth, Little White Salmon, and Carson NFHs) and Willamette River hatcheries. More recently, these and other facilities in the basin have used adults returning to the hatcheries or satellite collection sites to supply gametes for their programs (Myers et al. 1998). The total adult return goal for Dworshak NFH and Clearwater Fish Hatchery is 21,135 spring Chinook over Lower Granite Dam. Currently Kooskia NFH and the Nez Perce Tribal Hatchery do not have established adult return goals.

Spring Chinook salmon enter the Columbia River and begin spawning migrations during April and May, reaching the Clearwater subbasin from April through July. Spawning typically occurs in tributaries and headwater streams in August and September. Eggs hatch in December with emergence complete by April. Spring Chinook remain in fresh water for one year, migrating to the ocean in the spring of their second year, typically from March through June. Nearly all adult spring and summer Chinook that return to the Snake River Basin result from fish that emigrate as yearlings in April-May.

2 Current Conditions

Adult spring Chinook returns to the South Fork Clearwater River consist primarily of hatchery-origin fish. Both natural- and hatchery-origin components of this population are not listed under the ESA. Hatchery programs operate out of the Clearwater Fish Hatchery and the Nez Perce Tribal Hatchery. Broodstock for both hatchery programs was founded primarily from the Rapid River Hatchery stock, with significant contributions from Carson-stock hatcheries (Leavenworth, Little White Salmon, and Carson NFHs) and Willamette River hatcheries. Augmentation or supplementation programs incorporate both hatchery- and natural-origin fish into spawning designs (e.g., collected in Newsome Creek, Red River, and Crooked River terminal areas).

The current distribution of spring Chinook salmon in the Clearwater River subbasin includes the Lolo Creek drainage and all major drainages above the confluence of the Middle and South Forks of the Clearwater River. Relatively contiguous distributions of spring/summer Chinook salmon exist in the Lolo/Middle Fork, South Fork, and Upper and Lower Selway. Spring/summer Chinook salmon are absent from many tributaries in the Lochsa River drainage, but found in Pete King Creek and Fish Creek, and most

tributaries above (and including) Warm Springs Creek. Natural abundance (number of adults spawning in natural production areas) is unknown for this population.

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 224 and between 0.50 and 0.60, respectively. The model also estimates that 274 hatchery origin Chinook stray into this population each year.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** The non-indigenous spring- and summer-run stocks currently used in the Clearwater River subbasin are not considered part of the Snake River Spring- and Summer-Run ESU, and are not listed under the ESA (57 FR 14653).
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Stabilizing. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** Not listed, not applicable
- **Productivity Improvement Expectation:** NA
- **Habitat Productivity and Capacity (S.F. Clearwater):** Productivity: 1.30; Capacity: 1,875
- **Habitat Productivity and Capacity (Newsome Creek):** Productivity: 1.30; Capacity: 625.

2.2 Current Hatchery Programs Affecting this Population

The primary spring Chinook hatchery programs affecting this population are operated at the Clearwater Fish Hatchery and the Nez Perce Tribal Hatchery.

Approximately 750 spring Chinook salmon adults are needed for broodstock for the Nez Perce Tribal Hatchery spring Chinook program. This number includes jacks and accounts for pre-spawning mortality. This brood level will provide for a target release of 75,000 pre-smolts from Newsome Creek (South Fork Clearwater River) acclimation facility, 150,000 pre-smolts from Yoosa/Camp (Lolo Creek) acclimation facilities, and 400,000 parr into Meadow Creek (Selway River).

Approximately 1,860 Chinook are needed for broodstock for the Clearwater Fish Hatchery spring Chinook salmon program, a number which includes 1,020 for Powell, 840 for the South Fork program (Crooked and Red rivers), and accounts for pre-spawning mortality. The adult return goal for the LSRCF-funded Clearwater Chinook program is 11,915 adult Chinook over Lower Granite Dam.

The Clearwater Fish Hatchery segregated spring Chinook program volitionally releases approximately 400,000 smolts (17 fpp) into the Red River at the Red River Satellite facility and approximately 700,000 smolts (17 fpp) into the Crooked River at the Crooked River Satellite Facility (upper and lower sites combined). All smolts released are 100% adipose fin-clipped and a portion coded wire and PIT-tagged. Adult collection occurs at Red River and Crooked River satellite facilities from May to August. All broodstock are held at the Red River satellite facility until transfer to the Clearwater Fish Hatchery for spawning. Incubation and initial rearing occurs at Clearwater Fish Hatchery. In late

March, smolts are moved to satellite sites for acclimation. Fish are volitionally released between April 10th and 15th. The program has an R/S value of 4.0.

The Nez Perce Tribal Hatchery spring Chinook segregated hatchery program releases approximately 75,000 pre-smolts into Newsome Creek. Adult collection occurs at the Newsome Creek adult trap. Adults are transferred to the Nez Perce Tribal Hatchery for holding and spawning (the proportion of natural- and hatchery-origin adults in the spawning design is not known). Incubation and early rearing occur at the Tribal Hatchery. Pre-smolts are transferred to the Sweetwater Spring facility, held until late August/early September (when water temperatures cool) and then transferred to the Newsome Creek acclimation facility. Prior to release, approximately 6,000 fish are PIT-tagged. Volitional release commence in early October, with all remaining fish forced out by mid-October. Target size at release is 29 fpp. The program has an R/S value of 1.00.

In 1991, the IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study designed to continue through 2014. The project incorporates treatment and control streams in the Clearwater and Salmon subbasins. Within this population zone, the Chinook Supplementation Study maintains the following control and treatment streams: Control: American River; Treatment: Newsome Creek, Crooked River, and Red River. “Treatments” include developing and releasing “supplementation” smolts (hatchery x natural parents) and releasing “supplementation” adults to treatment spawning streams (50:50 hatchery: natural-origin release design). In 2004, juvenile treatments ended in all but three study streams, and in 2007, adult treatments ended. The study will conclude in 2014 following a five-year period of “no treatment” evaluation.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 29
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 245

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The

solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008). Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.5 and 0.6 to 1.1 and 1.2. Average abundance of natural-origin spawners (NOS) would increase from approximately 234 fish to approximately 301 fish. The harvest contribution of the natural and hatchery populations would go from approximately 2,179 fish to approximately 54 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for South Fork Clearwater River Spring Chinook that emphasizes maintaining existing natural spawning populations, maintaining existing hatchery mitigation programs, and using hatchery-origin Chinook salmon in an attempt to augment natural production. Currently this population is not operating consistent with the HSRG-defined standards for a Primary or Contributing population (pHOS exceeds 0.1).

The LSRCP mitigation goal for Dworshak National and Clearwater fish hatcheries is 9,135 and 11,915 adult spring Chinook to the project area upstream of Lower Granite Dam. Currently Kooskia NFH and the Nez Perce Tribal Hatchery do not have established adult return goals.

Newsome Creek: The near-term management objective for the Newsome Creek population component is to increase natural production with longer term objectives to also provide terminal harvest. Increasing natural-origin escapement is unlikely with the current pre-smolt release program given the low productivity in the system and the low recruits per spawner of the current hatchery program. Depending on the composition of adult returns, natural-origin fish may be incorporated in the broodstock. The composition of adults spawning in the habitat varies. The Newsome Creek program has a release objective of 75,000 pre-smolts. Incubation and rearing occur at the Nez Perce Tribal Hatchery.

Crooked River/Red River: This population component is being managed as a Stabilizing component to provide harvest. The current program is operated consistent with the objectives provided by the managers. Segregated programs operate out of the Clearwater Fish Hatchery

with production targets of approximately 700,000 smolts in Crooked River and 400,000 smolts in Red River.

Broodstock for all three programs is collected locally. Red River and Crooked River adults are temporarily held at the Red River satellite for transfer to the Clearwater Fish Hatchery for spawning. Newsome Creek adults are held locally until transfer to the Nez Perce Tribal Hatchery for spawning. Spawning, incubation and rearing takes place at the Tribal hatchery. Smolts are transferred back to Red River and Crooked River acclimation sites and are volitionally released. Pre-smolts are transferred to an acclimation pond in the Newsome Creek drainage in the fall where they rear until they are volitionally released in October. Pre-smolts are 100% coded wire-tagged and about 6,000 are PIT-tagged.

The HSRG acknowledges that managing for the recommended PNI values may not be possible or appropriate when abundance levels are low and demographic risks to the population increase. To address this concern, it is the HSRG's understanding that managers have developed a variable sliding scale for managing abundance so that in low abundance years, more hatchery-origin fish of the appropriate population component are allowed to reach the spawning grounds to reduce demographic risk to the respective populations.

The ongoing Idaho Supplementation Study is ending in 2014. Adult returns from this program ended in 2007. The current phase of the study monitors production and productivity in the absence of adult supplementation. Following 2014, managers will have greater flexibility to pursue other management options.

IDFG's implementation of BKD risk management strategies, including culling, has been very successful.

Recommendations

The managers should coordinate the programming of all salmon populations reared in the Clearwater Fish Hatchery, Dworshak National Fish Hatchery, Kooskia National Fish Hatchery and Nez Perce Tribal Hatchery to maximize the benefits of available water supply, appropriate water temperature, and rearing containers. Operating these four major hatcheries as a coordinated system would facilitate the movement of programs/populations between and among the different hatcheries. This would maximize survival by producing fish in good condition for release at the appropriate life stage.

Newsome Creek: The HSRG recommends converting the current pre-smolt program to a smolt program of the same size (approximately 75,000 smolts, pNOB=100%, PNI=0.6) and allowing all other returning adults to spawn (excluding strays from the segregated programs). This would allow the program to operate consistent with the standards of a Contributing population and reduce the ecological impacts of parr releases on naturally rearing spring Chinook. This approach is expected to increase the total spawners as well as natural-origin spawners via reproduction by hatchery-origin recruits in Newsome Creek.

Crooked River/ Red River: The HSRG has no specific recommendations for this program.

The HSRG also recommends that managers continue to implement their apparently successful BKD risk management strategies, which include culling.

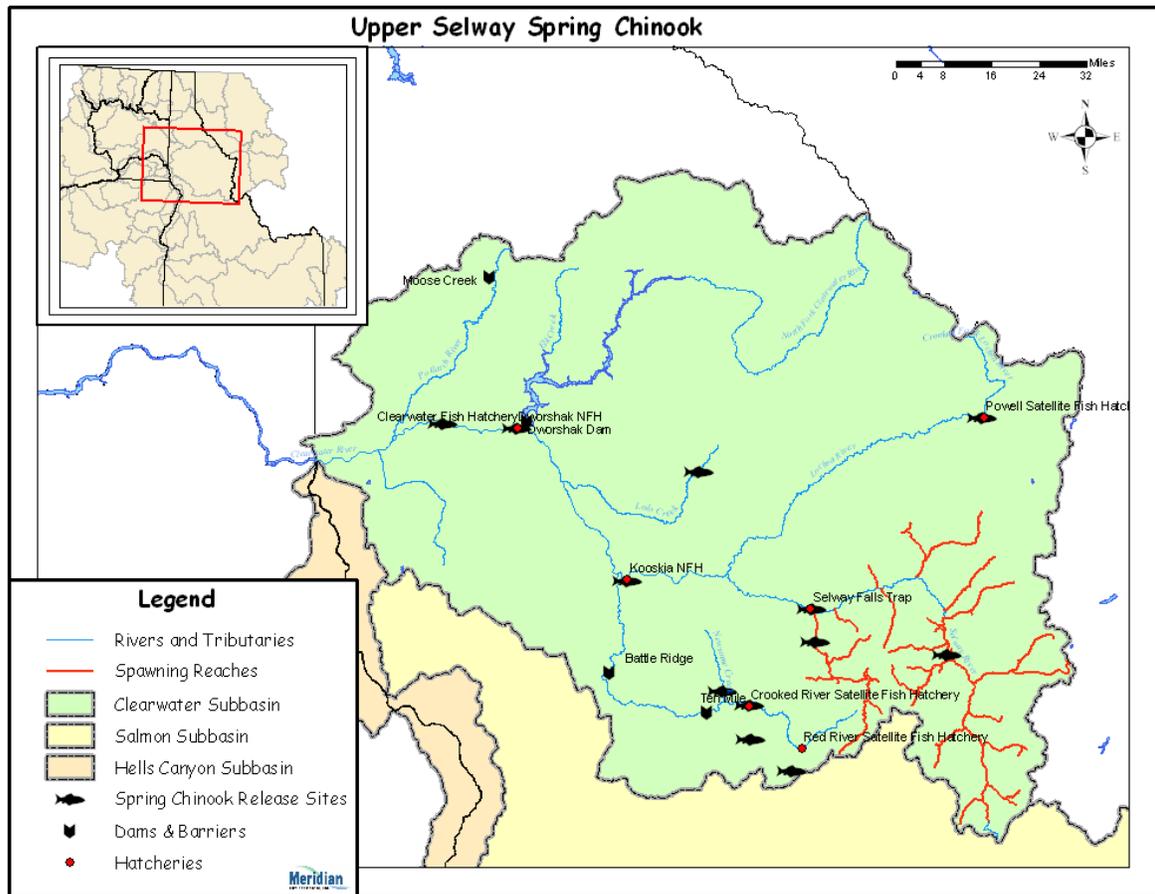
Table 1. Results of HSRG analysis of current condition and HSRG Solution for South Fork Clearwater Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 49% | 0.00 | 191 | 0.5 | 43 | 0 |
| | Newsome Creek Int Both | 75.4 | 50% | 0% | 44% | 0.08 | 43 | 0.6 | 11 | 10 |
| | Seg Harv | 1,100.0 | 90% | | | | | | 2,125 | 1,153 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 179 | 1.1 | 41 | - |
| | Newsome Creek None | - | 0% | 0% | 0% | 1.00 | 122 | 1.2 | 13 | - |
| HSRG Solution | Int Both | - | 0% | 0% | 48% | 0.00 | 215 | 0.6 | 49 | 0 |
| | Newsome Creek Int Both | 75.3 | 0% | 0% | 53% | 0.65 | 175 | 1.0 | 52 | 1 |
| | Seg Harv | 1,100.0 | 90% | | | | | | 2,237 | 1,265 |
| HSRG Solution w/ Improved Habitat | Int Both | - | 0% | 0% | 44% | 0.00 | 252 | 0.6 | 57 | 0 |
| | Newsome Creek Int Both | 75.3 | 0% | 0% | 47% | 0.68 | 222 | 1.1 | 57 | 1 |
| | Seg Harv | 1,100.0 | 90% | | | | | | 2,237 | 1,265 |

Hatchery Scientific Review Group Review and Recommendations

Upper Selway River Spring Chinook Population and Related Hatchery Programs

January 31, 2009



1 Upper Selway River Spring Chinook

The Snake River Spring- and Summer-Run ESU was listed as threatened under the Endangered Species Act (ESA) on August 22, 1992 and reaffirmed on June 28, 2005. The ESU includes those fish that spawn in the Snake River drainage and its major tributaries, including the Grande Ronde and the Salmon Rivers, and that complete their adult, upstream migration (passing Bonneville Dam) between March and July. Fifteen artificial propagation programs are also included in the ESU; however, the non-indigenous hatchery spring- and summer-run Chinook stocks currently used in the Clearwater River and its tributaries, including the Selway River, are not considered part of the ESU (57 FR 14653).

Spring Chinook salmon were likely extirpated from the Clearwater River subbasin following the construction of Lewiston Dam in 1927. When the Kooskia and Dworshak National Fish Hatcheries (NFHs) were completed in 1967 and 1969, millions of spring Chinook were released into the Clearwater River and its tributaries, primarily as yearling smolts. Broodstock for these hatcheries came primarily from the Rapid River Hatchery (considered an upper Snake River stock), with significant contributions from Carson-stock hatcheries (Leavenworth, Little White Salmon, and Carson NFHs) and Willamette River hatcheries. More recently, these and other facilities in the subbasin have used adults returning to the hatcheries or satellite collection sites to supply gametes for their programs (Myers et al. 1998). The total adult return goal for Dworshak NFH and Clearwater Fish Hatchery is 21,135 spring Chinook over Lower Granite Dam. Currently Kooskia NFH and the Nez Perce Tribal Hatchery do not have established adult return goals.

Spring Chinook salmon enter the Columbia River and begin spawning migrations during April and May, reaching the Clearwater subbasin from April through July. Spawning typically occurs in tributaries and headwater streams in August and September. Eggs hatch in December with emergence complete by April. Spring Chinook salmon remain in fresh water for one year, migrating to the ocean in the spring of their second year, typically from March through June. Nearly all adult spring and summer Chinook that return to the Snake River Basin result from fish that emigrate as yearlings in April-May.

2 Current Conditions

Adult spring/summer Chinook returns to upper Selway River consist primarily of hatchery-origin fish, resulting from a hatchery program operated by the Nez Perce Tribe with cooperation from the IDFG and the Clearwater Fish Hatchery. Both natural- and hatchery-origin components of this population are not listed under the ESA. The reintroduced spring Chinook population in the upper Selway River was originally derived from the Rapid River Hatchery, with significant contributions from Carson-stock hatcheries (Leavenworth, Little White Salmon, and Carson NFHs) and Willamette River hatcheries. This composite population is now supplemented with Selway River natural returns. The upper Selway River is generally considered to extend from the confluence of Running Creek up through the McGruder section.

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 127 and 0.60, respectively. The model also estimates that 188 hatchery origin Chinook stray into this population each year.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** The non-indigenous spring- and summer-run stocks currently used in the Clearwater River subbasin are not considered part of the Snake River Spring- and Summer-Run ESU, and not listed under the ESA (57 FR 14653).
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for a Stabilizing population designation.
- **Recovery Goal for Abundance:** Not listed, not applicable.
- **Productivity Improvement Expectation:** NA
- **Habitat Productivity and Capacity:** Productivity: 1.3; Capacity: 600

2.2 Current Hatchery Programs Affecting this Population

The current Upper Selway hatchery program releases approximately 300,000 parr (100 fpp) directly to the upper Selway River in the McGruder Corridor in mid-July. Parr are not adipose fin-clipped but may be Oxytetracycline-marked. Broodstock adults are sourced from South Fork Clearwater hatchery-origin returns (trapped at Crooked River or Red River) or from returns to the Rapid River Fish Hatchery. Spawning, incubation, and rearing through release occur at the Clearwater Fish Hatchery. The program has an R/S value of 0.9.

In 1991, the IDFG, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the USFWS initiated a large-scale Chinook salmon supplementation study that was designed to continue through 2014. The study incorporates treatment and control streams in the Clearwater and Salmon subbasins. Within this ICTRT population zone, Whitecap Creek, a tributary to the upper Selway River, is maintained as a control stream. “Treatments” include the development and release of “supplementation” smolts (hatchery x natural parents) and the release of “supplementation” adults to treatment spawning streams (50:50 hatchery: natural-origin release design). In 2004, juvenile treatments ended in all but three study streams. In 2007, adult treatments ended. The study will conclude in 2014 following a five-year period of “no treatment” evaluation.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 188

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For

example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.2. Average abundance of natural-origin spawners (NOS) would decrease from approximately 127 fish to approximately 117 fish. The harvest contribution of the natural and hatchery populations would go from approximately 34 fish to approximately 13 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Upper Selway River Spring Chinook that emphasizes maintaining existing natural spawning populations, and using hatchery-origin Chinook salmon in an attempt to augment natural production. Currently this population does not meet the standards for a Primary or Contributing population (pHOS greater than 10%).

The Upper Selway River hatchery program has a release goal of 300,000 parr (100 fpp). Broodstock are sourced from South Fork Clearwater River returns or from Rapid River Fish Hatchery returns. Adults are held at the Clearwater Fish Hatchery and spawned. Incubation and rearing through release also occurs at the Clearwater Hatchery. Parr, released to the upper Selway River in mid-July, are not adipose fin-clipped but may

receive an oxytetracycline mark. Broodstock consist of 100% hatchery-origin adults. There is no ability to manage the composition of spawners in the wild.

The ongoing Idaho Supplementation Study is ending in 2014. Adult returns from this program ended in 2007. The current phase of the study monitors production and productivity in the absence of adult supplementation. Following 2014, managers will have greater flexibility to pursue other management options.

Recommendations

At the current level of juvenile production and with no capability in place to collect returning adults for broodstock or to control the composition of adults on spawning grounds, managers will not meet HSRG-defined standards for Contributing or Primary populations. While not presented, the HSRG identified that managers could meet the HSRG-defined standards for a Contributing population. One way to accomplish this would be to source 100% natural-origin adults for broodstock, reduce juvenile releases to 100,000 fish, and transition to a smolt release from a parr release. Transitioning to a release program that plants 100,000 smolts instead of 300,000 parr will increase survival back to the habitat and may reduce potential competitive concerns with naturally produced Chinook salmon juveniles in the upper Selway River system. Use of selective fishing or trapping gear could provide the means to collect natural-origin broodstock and provide additional harvest benefit as well.

The managers should coordinate the programming of all salmon populations reared in the Clearwater Fish Hatchery, Dworshak National Fish Hatchery, Kooskia National Fish Hatchery and Nez Perce Tribal Hatchery to maximize the benefits of available water supply, appropriate water temperature, and rearing containers. Operating these four major hatcheries as a coordinated system would facilitate the movement of programs/populations between and among the different hatcheries. This would maximize survival by producing fish in good condition for release at the appropriate life stage.

The HSRG recommends that managers continue to implement their apparently successful BKD strategies, which include culling.

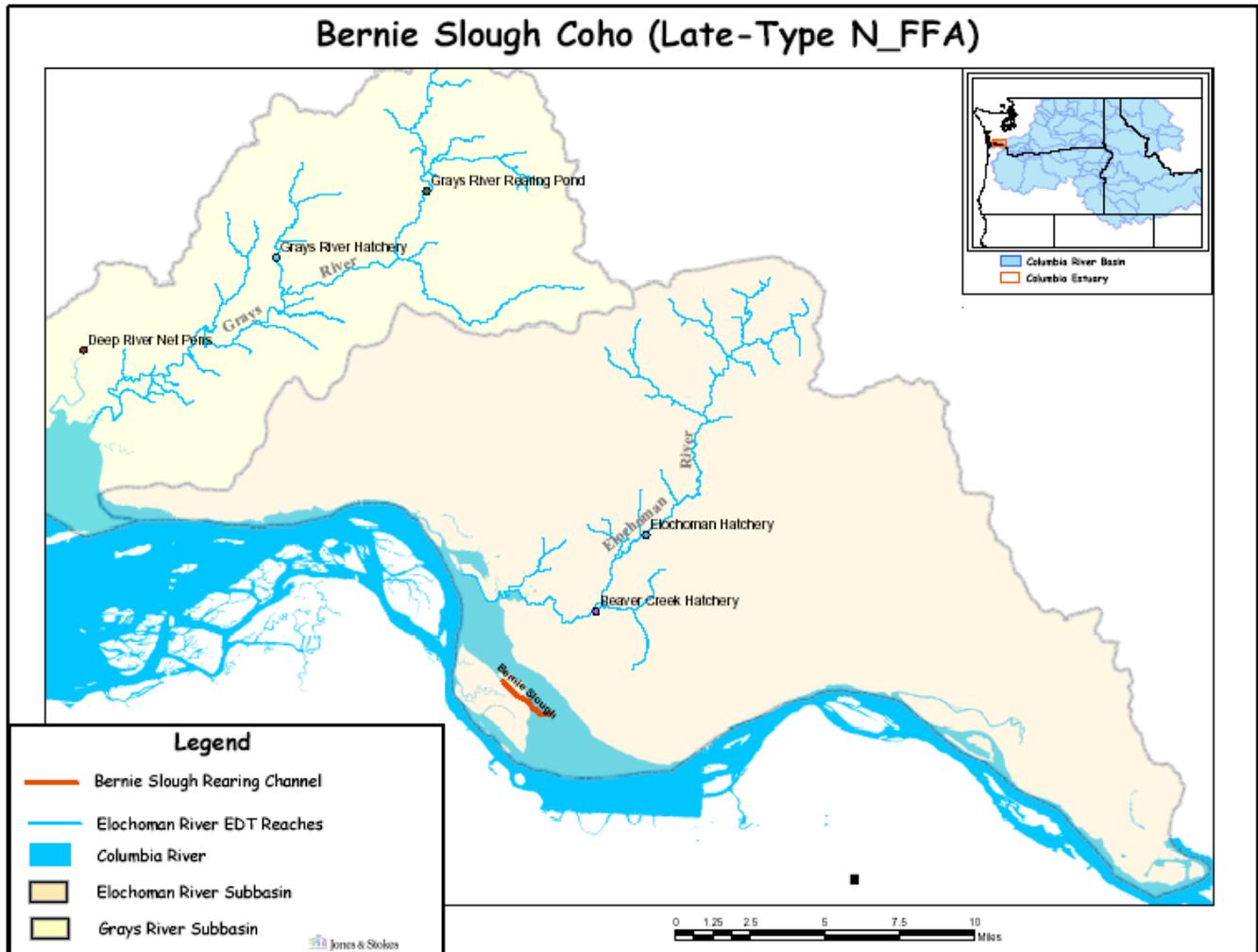
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Upper Selway Spring Chinook. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 54% | 0.00 | 127 | 0.6 | 14 | 0 |
| | Seg Harv | 300.3 | 0% | | | | | | 20 | 0 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 117 | 1.2 | 13 | - |
| HSRG Solution | None None | - | 0% | 0% | 53% | 0.00 | 141 | 0.6 | 15 | 0 |
| | Seg Harv | 300.3 | 0% | | | | | | 21 | 0 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 50% | 0.00 | 161 | 0.7 | 18 | 0 |
| | Seg Harv | 300.3 | 0% | | | | | | 21 | 0 |

Hatchery Scientific Review Group Review and Recommendations

Columbia Estuary - Bernie Creek FFA Coho Population and Related Hatchery Programs

January 31, 2009



1 Columbia Estuary - Bernie Creek FFA Coho

This is an education program for the Wahkiakum High School chapter of Future Farmers of America (FFA) in Cathlamet, Washington. Bernie Creek is a very small stream that enters the Columbia River at Cathlamet. The stream flows into a pond prior to exiting through a recently refurbished ladder directly into the Columbia River.

Fingerling Type N coho at about 20 fish per pound (fpp) are transferred to the FFA pond in early March from the Elochoman Hatchery. Coho smolts are reared and released from mid-April to early May at about 17 fpp. Current production should provide the maximum number of escaping adults needed for this small stream with current and future habitat conditions.

2 Current Conditions

2.1 Current Population Status and Goals

This program is for educational purposes only with little, if any, management implications.

- **ESA Status:** This population is not listed. Elochoman Hatchery coho are part of the Lower Columbia Coho ESU which has been listed as a threatened.
- **Population Description:** Bernie Creek likely provides very limited, if any, habitat for natural coho production.
- **Current Viability Rating:** Likely Very Low, at best.
- **Recovery Goal for Abundance:** Bernie Creek likely doesn't provide any habitat for coho.
- **Productivity Improvement Expectation:** None
- **Habitat Productivity and Capacity (from EDT):** None
- **Populations Affected by this Hatchery Population Include:** Smolts leaving the FFA pond could prey upon chum salmon fry in the lower Columbia River.

2.2 Current Hatchery Programs Affecting this Population

Seventeen thousand smolts from Elochoman Hatchery are transferred to the FFA pond on Bernie Creek for acclimation.

- **PNI and pHOS Estimates (include straying from all hatchery programs):** The HSRG is not aware of any returning adults to Bernie Creek.
- **Estimated Productivity (with harvest and fitness factor effects from AHA):** None
- **Projected Average Natural Origin Escapement:** The feasibility of escapement into Bernie Creek is not known, but expected to be very low, if any.
- **Average Harvest Contribution:** 148 adults

Estimated number of hatchery strays affecting this program:

- **Hatchery strays from in-basin integrated hatchery program:** N/A
- **Hatchery strays from in-basin segregated and out-of-basin hatchery programs:** N/A

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Without the hatchery program, Bernie Creek likely would not support any natural coho production.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is an educational program.

Recommendations

This coho program should continue to be operated and sized for educational purposes only. The educational value of the program might be improved by incorporating spawner surveys, smolt assessment/enumeration, and habitat assessments to determine carrying capacity of Bernie Creek.

The FFA and WDFW should consider using the program to raise chum salmon for recovery purposes.

The program objectives should not be altered, but education/management should be consistent with HSRG principles.

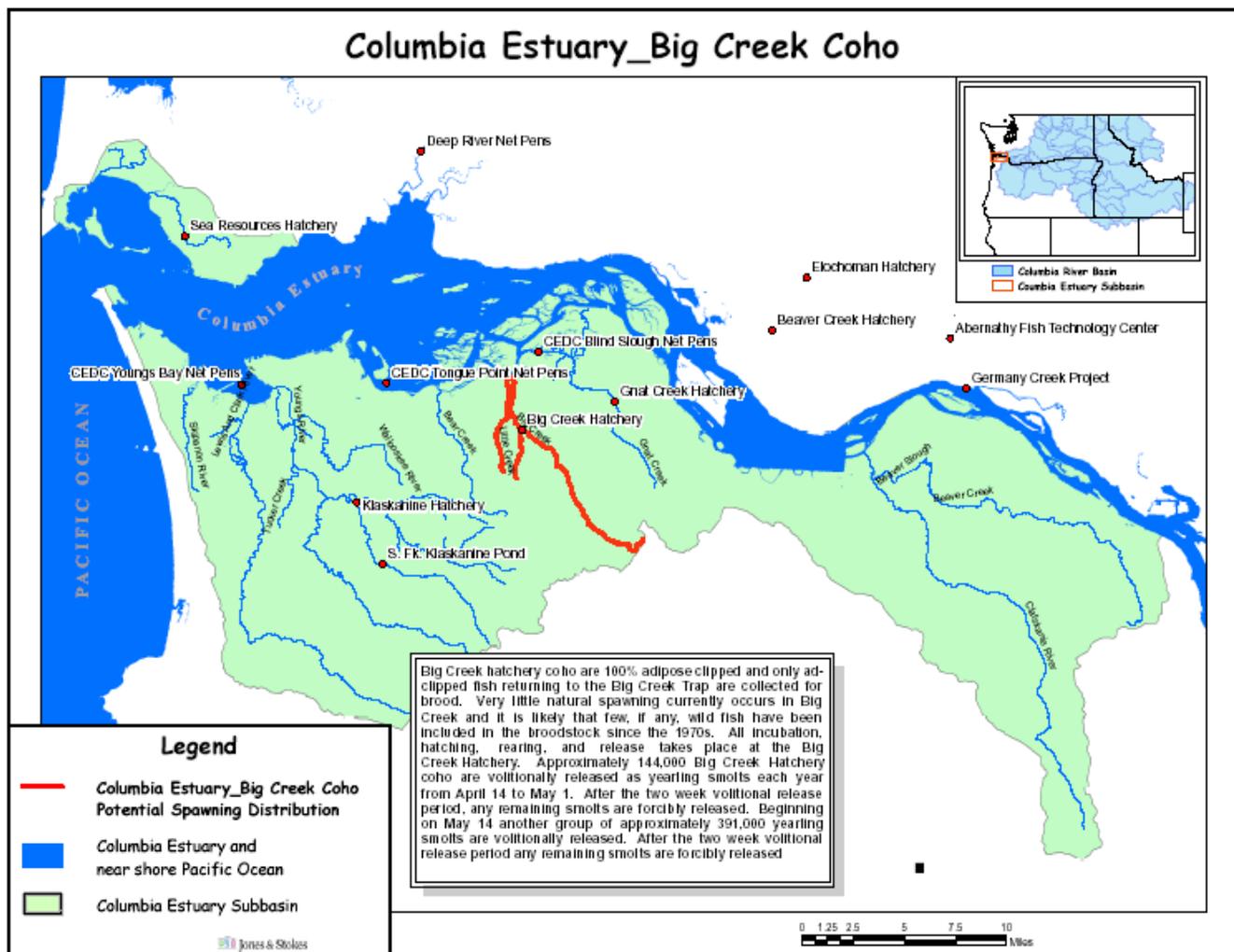
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Bernie Creek Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 16.5 | 10% | | | | | | 148 | 19 |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 16.5 | 10% | | | | | | 255 | 8 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 16.5 | 10% | | | | | | 255 | 8 |

Hatchery Scientific Review Group Review and Recommendations

Columbia Estuary - Big Creek Coho Population and Related Hatchery Programs

January 31, 2009



1 Columbia Estuary- Big Creek Coho

The Columbia Estuary Big Creek Coho population is dominated by hatchery returns. Since the 1970s, it has been based on returns of hatchery-origin adults to the hatchery with few, if any, wild fish introductions into the broodstock. Currently there are few, if any, natural-origin adults returning to Big Creek or nearby streams. The purpose of the Big Creek Coho Hatchery program is to provide harvest to mitigate for loss of fisheries resulting from habitat degradation and perturbations in the Columbia River arising from hydropower and other activities.

2 Current Conditions

2.1 Current Population Status and Goals

- **ESA Status:** This population is listed as threatened. It is part of the Lower Columbia River Coho ESU.
- **Population Description:** Big Creek coho are a Primary population.
- **Current Viability Rating:** Not defined, but likely Very Low.
- **Recovery Goal for Abundance:** Not defined
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity:** Productivity: 5.0; Capacity: 500
- **Populations Affected by this Hatchery Population:** Winter steelhead (Scappoose/Clatskanie), winter steelhead (Youngs Bay), fall Chinook (Sea Resources), and early coho (Sea Resources). Additionally, coho releases from this program could potentially impact other populations within the Lower Columbia River steelhead DPS, Lower Columbia River Chinook ESU, and the Columbia River chum ESU.
- **Hatchery Populations of the Same Species that Affect this Population (e.g., through straying) are:** Columbia Estuary Select Area Fishery Enhancement (SAFE) Program and potentially releases from Grays River and Elochoman River programs.

2.2 Current Hatchery Programs Affecting this Population

The current hatchery program is a segregated harvest program. Broodstock is derived from adipose-clipped adults returning to the hatchery (stock 13). All spawning, incubation, and rearing is done on-site. Resulting smolts (535,000 smolts) are adipose-clipped and released as yearlings. Releases are for the most part volitional and occur in two lots (144,000 between April 14 and May 1, and 391,000 between May 14 and 28). Fish that refuse to leave volitionally within 14 days are force-released. Additionally, up to 10,000 eggs are made available to local high schools (Astoria, Warrenton, Knappa, and Seaside) as part of the Salmon and Trout Enhancement Program (STEP). Fish that result from the STEP program are adipose-clipped and released to Youngs Bay.

- **PNI and pHOS Estimates (include straying from all hatchery programs):** 30%
- **Estimated Productivity (with harvest and fitness factor effects from AHA):** 2.02
- **Projected Average Natural Origin Escapement:** 211
- **Average Harvest Contribution:** 5005

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 114 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.0 to 4.0. Average abundance of natural-origin spawners (NOS) would increase from 211 to 338. Harvest contribution of the natural and hatchery populations would go from 5005 to 80 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is designated a Primary population with a hatchery program managed for a segregated harvest. The population is unlikely to meet the Primary population standards because of limited habitat for coho. If managed as a Primary population, then hatchery fish would need to be controlled on the spawning grounds and a small conservation hatchery should be considered. Even if these steps are taken, primary standards would not be met.

Recommendations

The status of this population should be re-evaluated as it does not seem to meet the criteria for a Primary designation. It is also recommended that the existing segregated program (580,000 smolt release) be continued, which is consistent with a stabilizing designation.

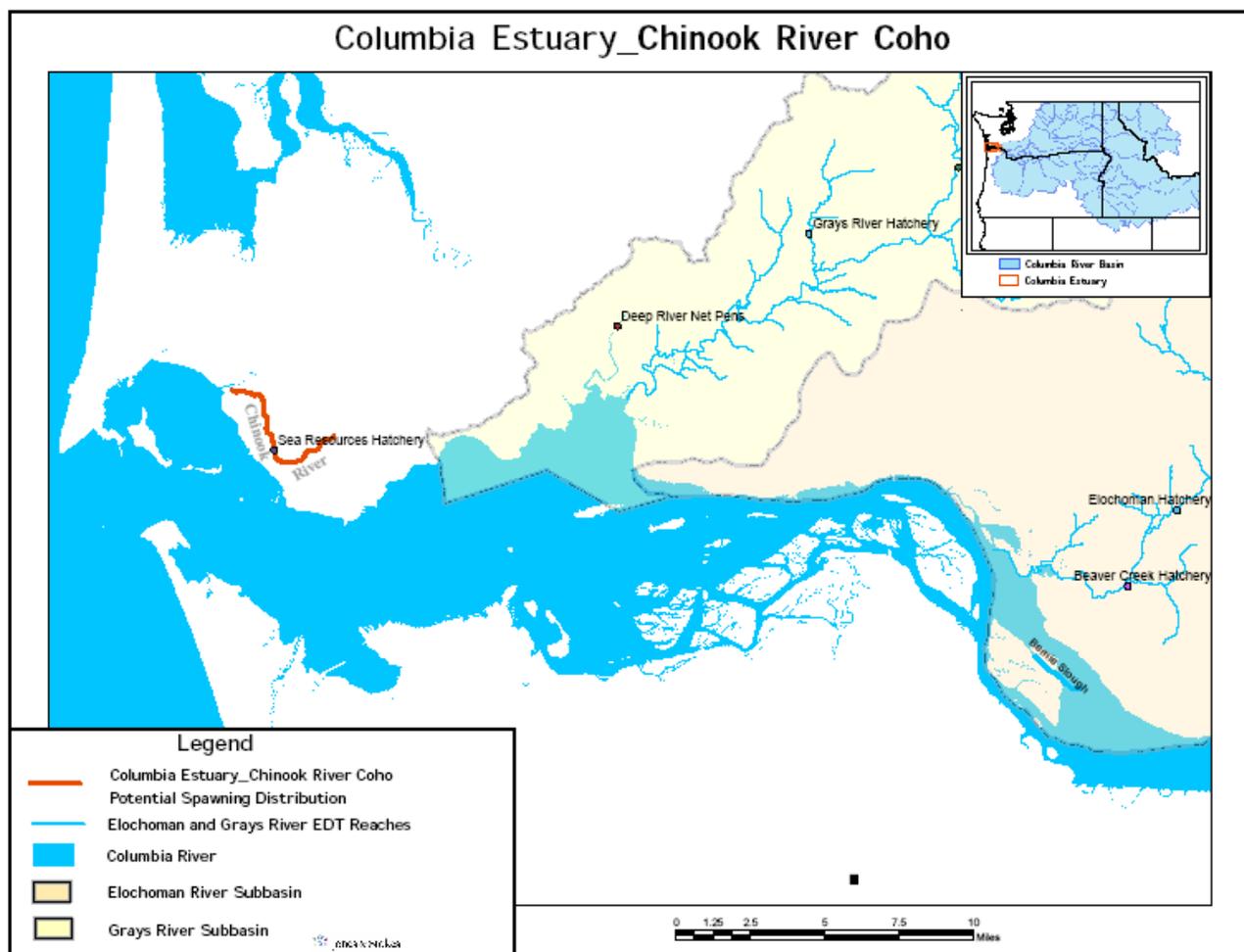
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Big Creek Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 90% | 0% | 30% | 0.00 | 211 | 2.0 | 50 | 0 |
| | Seg Harv | 582.1 | 90% | | | | | | 4,955 | 1,343 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 338 | 4.0 | 80 | - |
| HSRG Solution | Int Cons | - | 90% | 0% | 27% | 0.00 | 206 | 2.0 | 49 | 0 |
| | Seg Harv | 582.1 | 90% | | | | | | 5,347 | 990 |
| HSRG Solution w/ Improved Habitat | Int Cons | - | 90% | 0% | 25% | 0.00 | 234 | 2.2 | 56 | 0 |
| | Seg Harv | 582.1 | 90% | | | | | | 5,347 | 990 |

Hatchery Scientific Review Group Review and Recommendations

Chinook River Coho Population and Related Hatchery Programs

January 31, 2009



1 Chinook River Coho

Chinook River coho naturally spawn during the period of early November through January in the mainstem Chinook River and tributaries upstream of the WDFW fish weir (Rkm 7.7). While this population is described in the Lower Columbia Fish Recovery Board Recovery Plan as Grays/Chinook coho, no status for the Chinook River component is provided.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: unknown
- Population Description: Chinook River coho are included with the Grays River population and together are a Primary population.
- Recovery Goal for Abundance: See Grays River coho
- Productivity Improvement Expectation: N/A
- Habitat Productivity and Capacity (e.g., from EDT): Productivity:3.7; Capacity: 100

2.2 Current Hatchery Programs Affecting this Population

- No hatchery programs are operating in this watershed.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 94 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines

for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008). (Including strays from other hatchery programs). Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.5 to 3.0. Average abundance of natural-origin spawners (NOS) would increase from 48 to 59. Harvest contribution of the natural and hatchery populations would go from 11 to 14.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rate).

3.3 HSRG Observations/Recommendations

Observations

No observations were made for this population.

Recommendations

The HSRG has no specific recommendations for this population.

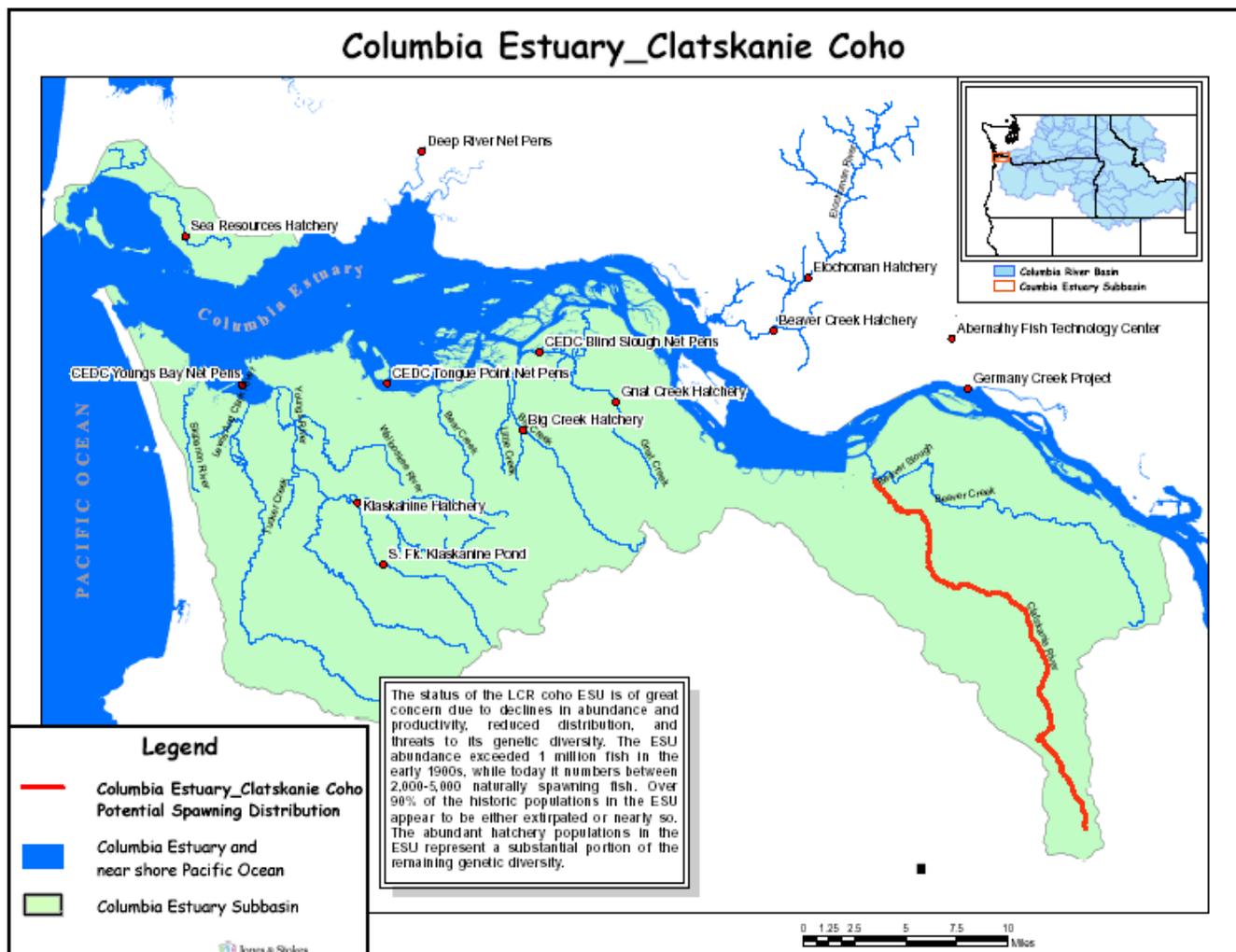
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Chinook River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 61% | 0.00 | 48 | 1.5 | 11 | 0 |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 59 | 3.0 | 14 | - |
| HSRG Solution | None | - | 0% | 0% | 65% | 0.00 | 49 | 1.5 | 12 | 0 |
| | None | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None | - | 0% | 0% | 63% | 0.00 | 55 | 1.6 | 13 | 0 |
| | None | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Clatskanie River Coho Population and Related Hatchery Programs

January 31, 2009



1 Clatskanie River Coho

The Columbia Estuary Clatskanie coho population is a natural component of the Lower Columbia River Coho ESU. There are no hatchery programs in the Clatskanie River and little information is available to describe population status and trends. As part of their implementation plan for managing lower Columbia River coho, the Oregon Department of Fish and Wildlife (ODFW) reported that 94 and 808 naturally spawning coho were identified in the Clatskanie River in 2002 and 2003, respectively. The population is believed to have been at low abundance for many years. The proportion of the population made up of hatchery-origin spawners is highly variable. The ODFW also reported that up to 60 percent of the adults enumerated in some years were likely of hatchery origin (http://www.dfw.state.or.us/agency/commission/minutes/04/apr/b_2.pdf).

2 Current Conditions

2.1 Current Population Status and Goals

- ESA Status: This population is listed as threatened and is part of the Lower Columbia River Coho ESU.
- Population Description: Clatskanie coho are a Stabilizing population.
- Current Viability Rating: Very Low. The population is persisting at a minimum abundance threshold.
- Recovery Goal for Abundance: No goal established
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity: Productivity: 4.0; Capacity: 400
- Populations Affected by this Hatchery Population: NA
- Hatchery Populations of the Same Species that Affect this Population: Hatchery populations in the Lower Columbia River Coho ESU that could adversely affect this population (primarily through straying) include the Columbia Estuary Select Area Fishery Enhancement (SAFE) Program, the Bonneville Hatchery program, and releases from Grays River and Elochoman River programs in Washington.

2.2 Current Hatchery Programs Affecting this Population

No coho salmon hatchery program currently operates in the Clatskanie River; however, coho from other programs stray into the Clatskanie River. About 16 adult coho are estimated to stray into this system annually. Under the current scenario, pHOS is estimated at 8 percent even though no hatchery coho are released in the Clatskanie River. Annually, approximately 150 natural-origin adults are estimated to return to the Clatskanie River.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 16 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.9 to 3.4. Average abundance of natural-origin spawners (NOS) would increase from approximately 150 fish to approximately 268 fish. Harvest contribution of the natural and hatchery populations would go from approximately 25 fish to approximately 45 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated Stabilizing and has no hatchery program.

Recommendations

The HSRG recommends that this population continue to be managed for natural production as a Stabilizing population. Focus actions on habitat protection and improvement that will increase productivity and capacity of the system.

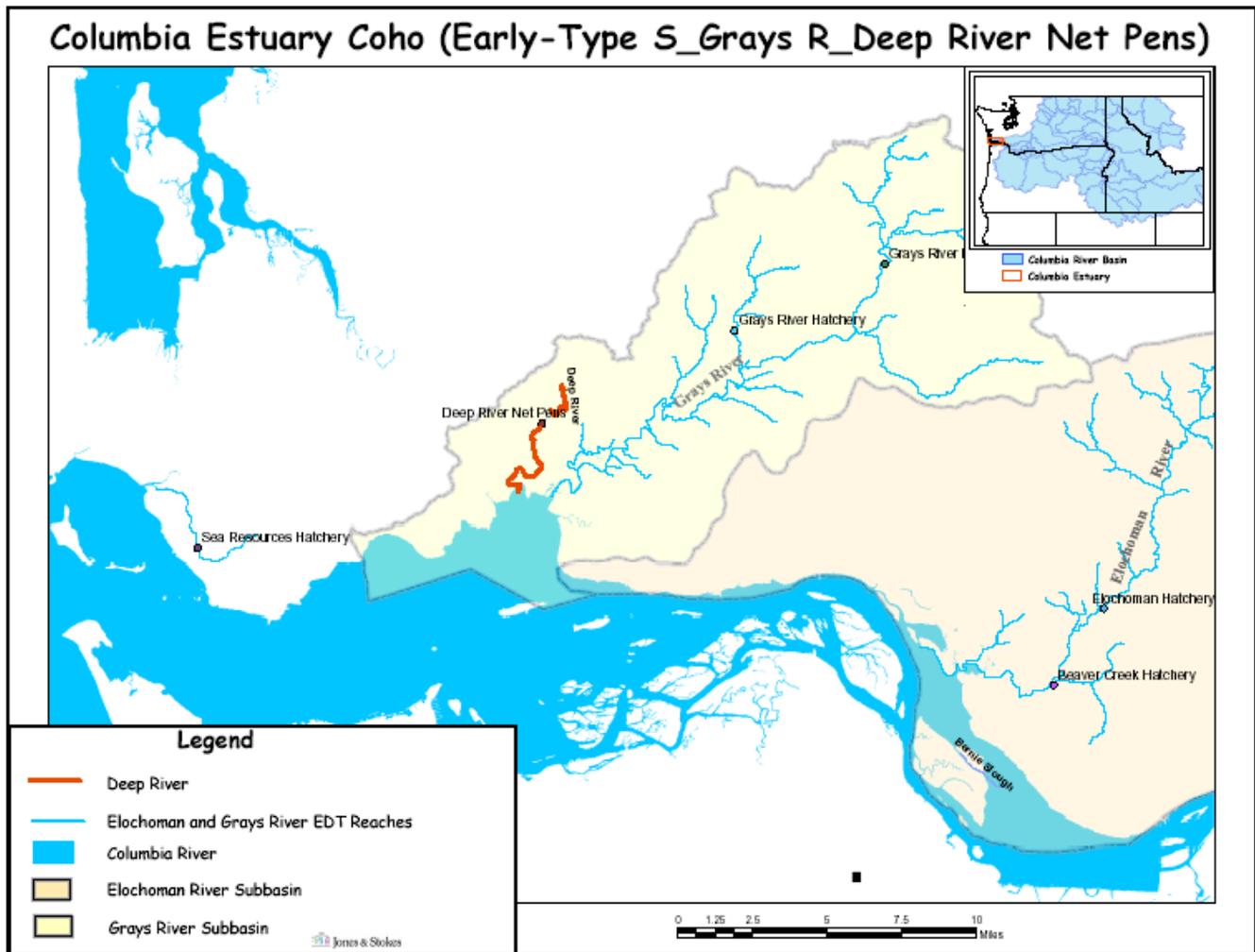
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Clatskanie River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 8% | 0.00 | 150 | 1.9 | 25 | 0 |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 268 | 3.4 | 45 | - |
| | None | | | | | | | | | |
| HSRG Solution | None | - | 0% | 0% | 6% | 0.00 | 161 | 2.1 | 28 | 0 |
| | None | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None | - | 0% | 0% | 5% | 0.00 | 212 | 2.5 | 36 | 0 |
| | None | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Columbia Estuary - Deep River Net Pen Coho Population and Related Hatchery Programs

January 31, 2009



1 Columbia Estuary - Deep River Net Pen Coho

The program releases 401,000 early, Type S coho (from the Grays River Hatchery) from net pens in the Deep River. The program is intended to provide coho back to a terminal fishery. Fingerlings are transferred to the net pens in mid-November at about 25 fish per pound (fpp). Fish are over-winter reared and released in early May at 10-14 fpp. Coho are released after natural chum fry have emerged and cleared the area. The program is operated as a segregated harvest program.

2 Current Conditions

2.1 Current Population Status and Goals

These coho are part of the Lower Columbia River Coho ESU and are listed as a threatened species. The net pen program is designed to put marked hatchery coho into the ocean, Buoy 10 and terminal fisheries where they can be harvested with minimal impact on ESA-listed natural-origin fish. These fish are not meant to contribute to any natural populations or recovery of the ESU.

- ESA Status: This population is not listed, although Lower Columbia River Coho ESU are ESA-listed as a threatened species
- Population Description: Deep River is not coho habitat and the net pen fish are not managed to contribute to any natural population.
- Current Viability Rating: NA
- Recovery Goal for Abundance: Net pen releases are not managed for contribution to recovery.
- Productivity Improvement Expectation: NA
- Habitat Productivity and Capacity (from EDT): NA
- Populations Affected by this Hatchery Population Include: Natural origin chum fry can be preyed upon by releases of net pen coho smolts. Consequently, coho releases are timed to avoid interactions with chum salmon. Adults not harvested in the terminal fishery stray to the Grays River.

2.2 Current Hatchery Programs Affecting this Population

Broodstock origin for the 401,000 smolt releases is from the Grays River Hatchery Type S program and the Toutle River Type S program. Terminal harvest is 97% on returning adults.

- PNI and pHOS Estimates (include straying from all hatchery programs): N/A
- Estimated Productivity (with harvest and fitness factor effects from AHA): N/A
- Projected Average Natural Origin Escapement: N/A
- Average Harvest Contribution: 7,963

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: N/A

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

The terminal fisheries program cannot function without a companion hatchery program. Current harvest is 7,963 fish from this program. Harvest contribution of the natural and hatchery populations would go from 7,963 to 0.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This program is supplied by Type S coho from the Grays River program (400,000 smolt release).

Recommendations

A segregated program for a selective terminal fishery could be sustained at the Deep River net pens releasing 440,000 Type S coho. The switch to an integrated Type N program at Grays River requires developing a new broodstock source for this program. The Type S coho production for the net pens could be supplied from Elochoman or other WDFW facilities that rear Type S coho (Lewis or Toutle).

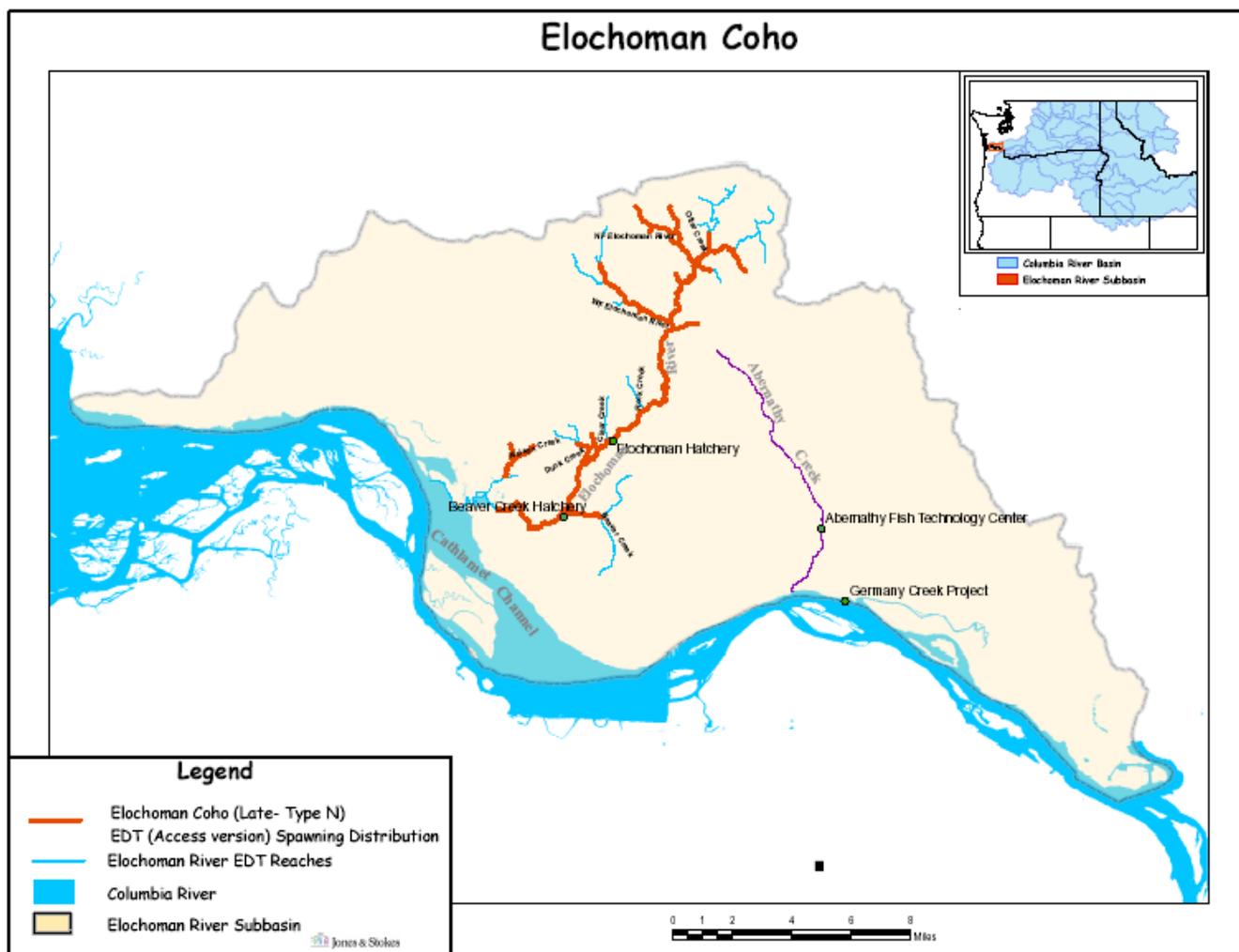
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Deep River Net Pen Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 401.3 | 10% | | | | | | 7,963 | 16 |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 441.0 | 0% | | | | | | 8,784 | 0 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 441.0 | 0% | | | | | | 8,784 | 0 |

Hatchery Scientific Review Group Review and Recommendations

Elochoman River Coho Population and Related Hatchery Programs

January 31, 2009



1 Elochoman River Coho

The Elochoman coho population is part of the threatened Lower Columbia coho ESU. It is designated as a Primary population. There are two coho hatchery programs in the Elochoman. One is based largely on broodstock originating from the Elochoman (Type N), and the other is based on broodstock of Toutle River origin (Type S).

2 Current Conditions

2.1 Current Population Status and Goals

The natural coho population in the Elochoman is a fraction of its historic abundance. Natural origin spawning escapement numbers were not available, but the population is rated as low in viability in the LCRSRP.

- **ESA Status:** This population is listed as threatened and is part of the threatened Lower Columbia ESU.
- **Population Description:** The Elochoman population is one of 13 in the ESU that are designated as Primary populations (LCSR&SP 2004).
- **Current Viability Rating:** Low, with a goal to achieve a High rating
- **Recovery Goal for Abundance:** 600 naturally spawning fish
- **Productivity Improvement Expectation:** The recovery plan (LCSR&SP 2004) does not provide a productivity improvement expectation for coho; however, for steelhead, a value of 10% is given. Until better information becomes available, a 10% improvement in habitat can be expected from implementation of the recovery plan.
- **Habitat Productivity and Capacity (from EDT):** Productivity 3.7; Capacity 1,300
- **Adjusted Productivity (accounting for fitness loss and harvest):** 1.4

2.2 Current Hatchery Programs Affecting this Population

There are two coho hatchery programs in the Elochoman. One is an integrated program derived from native brood (497,000 smolts); the other is a segregated program with brood originating from the Toutle (Type S) (418,000 smolts). The broodstock for the current integrated (Type N) program is of local origin. Adults are captured from volitional returns to the fish ladder-V trap near the Elochoman Hatchery, where incubation and rearing occur. This hatchery program is described as an integrated harvest program.

- The assumptions presented in AHA suggest a pNOB of about 3 percent and a pHOS of close to 50 percent, leading to a PNI of about 0.05.
- **Projected Average Natural Origin Escapement:** Likely does not consistently meet the goal of 600 spawners.
- **Average Harvest Contribution:** 8,970 fish, consisting mostly of hatchery fish from the integrated and segregated programs.
- Hatchery returns substantially exceed broodstock needs.

- Estimated number of hatchery strays affecting this program:
- Hatchery strays from in-basin integrated hatchery program: 668 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 864 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.6 to 3.1. Average abundance of natural-origin spawners (NOS) would increase from 662 to 827. Harvest contribution of the natural and hatchery populations would go from 8,970 to 160.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is a Primary population. The barrier at the hatchery is in disrepair and needs to be addressed to achieve higher trap efficiencies. The current segregated Type S program is inconsistent with the Primary designation for this population because of the inability to capture hatchery returns. The HSRG observed the hatchery facility to be in poor condition.

Currently this hatchery produces both Type N and Type S coho for a harvest program. WDFW is proposing to rebuild the rack in the lower river for Chinook collection; however, repair of existing barrier at the hatchery would still be needed if an integrated Type N program were to be emphasized.

We observe that the Type S segregated program could be increased without impacting compliance with a primary population designation.

Recommendations

The HSRG recommends reducing the Type N integrated program to 150,000 to reduce risks to recovery of naturally produced coho.

Continue the Type S segregated program (expand to 800,000 smolt release) if, and only if, repairs are made to the barrier at the hatchery (to exclude 95% of hatchery fish upstream of the barrier). This repair is a high priority.

Explore opportunities to produce an additional 400,000 fish release at Beaver Creek Hatchery.

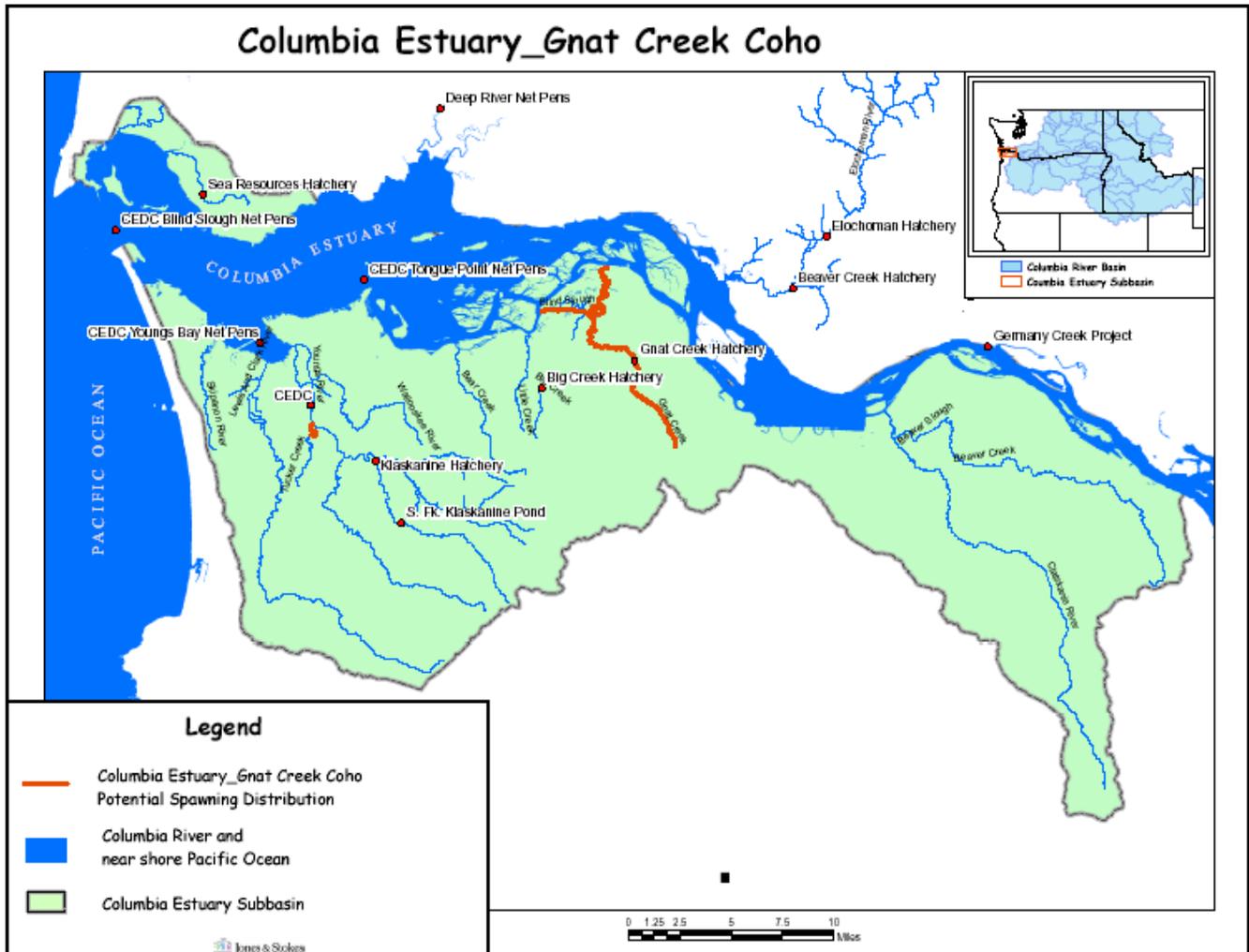
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Elochoman River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-----------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Late Type N Int Both | 496.1 | 90% | 0% | 65% | 0.04 | 662 | 1.6 | 4,774 | 5,509 |
| | Type S Seg Harv | 415.0 | 90% | | | | | | 4,196 | 4,335 |
| No Hatchery | Late Type N None None | - | 0% | 0% | 0% | 1.00 | 827 | 3.1 | 160 | - |
| HSRG Solution | Late Type N Int Both | 146.5 | 95% | 90% | 8% | 0.87 | 685 | 2.9 | 1,893 | 1,520 |
| | Type S Seg Harv | 1,201.1 | 95% | | | | | | 20,878 | 5,013 |
| HSRG Solution w/ Improved Habitat | Late Type N Int Both | 146.5 | 95% | 90% | 6% | 0.89 | 820 | 3.3 | 1,920 | 1,520 |
| | Type S Seg Harv | 1,201.1 | 95% | | | | | | 20,878 | 5,013 |

Hatchery Scientific Review Group Review and Recommendations

Columbia Estuary - Gnat Creek Coho Population and Related Hatchery Programs

January 31, 2009



1 Columbia Estuary - Gnat Creek Coho

This population is listed as threatened and is part of the Lower Columbia River Coho ESU. Gnat Creek is part of the Astoria population group and is monitored as part of that composite. Spawning survey data indicate that most coho observed in the subbasin are Type S hatchery stocks and few wild fish are present. Survey data indicates a bi-modal spawn timing with naturally-produced fish spawning in mid- to late November and another component spawning in December. There is little information specific to Gnat Creek to describe population status and trends.

2 Current Conditions

2.1 Current Population Status and Goals

- **ESA Status:** This population is listed as threatened and is part of the Lower Columbia River Coho ESU.
- **Population Description:** Gnat Creek coho are a stabilizing population.
- **Current Viability Rating:** Very Low. The population is persisting at a “minimum abundance” threshold.
- **Recovery Goal for Abundance:** Not established.
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity:** Productivity: 1.5; Capacity: 100
- **Populations Affected by this Hatchery Population Include:** Not applicable
- **Hatchery Populations of the Same Species that Affect this Population (primarily through straying):** Columbia Estuary Select Area Fishery Enhancement (SAFE) Program, the Bonneville Hatchery program, and releases from Grays River and Elochoman River programs in Washington.

2.2 Current Hatchery Programs Affecting this Population

No coho hatchery program currently operates in Gnat Creek; however, about 114 adult coho from other programs are estimated to stray into this system annually. Under the current scenario, pHOS is estimated at 70% even though no hatchery coho are released in Gnat Creek. Annually, approximately 40 natural-origin adults are estimated to return to Gnat Creek.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 114 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less

than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.3. Average abundance of natural-origin spawners (NOS) would decrease from approximately 38 fish to approximately 19 fish. Harvest contribution of the natural and hatchery populations would go from approximately 7 fish to approximately 3 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated Stabilizing and has no hatchery program.

Recommendations

The HSRG recommends that this population continue to be managed for natural production as a Stabilizing population. Focus actions on habitat protection and improvement that will increase productivity and capacity of the system.

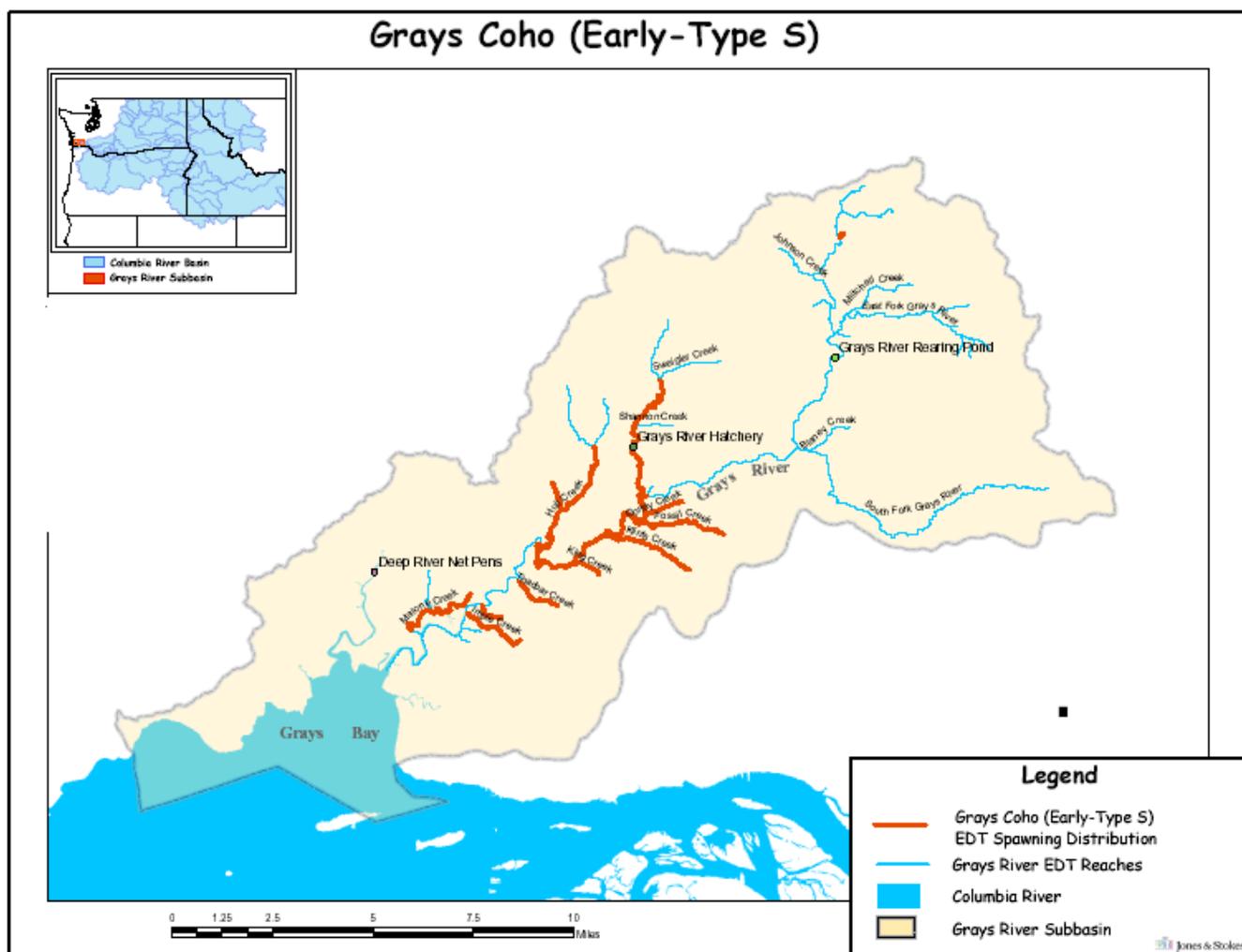
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Gnat Creek Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 71% | 0.00 | 38 | 0.6 | 7 | 0 |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 19 | 1.3 | 3 | - |
| | None | | | | | | | | | |
| HSRG Solution | None | - | 0% | 0% | 68% | 0.00 | 36 | 0.6 | 6 | 0 |
| | None | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None | - | 0% | 0% | 66% | 0.00 | 40 | 0.7 | 7 | 0 |
| | None | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Grays River Coho Population and Related Hatchery Programs

January 31, 2009



1 Grays River Coho

Native Grays River coho were historically a Type N stock characterized by later spawn timing (peaking in November and December) and an ocean distribution north of the Columbia River. The Type S hatchery production in the river, and subsequent naturally spawning hatchery individuals, has influenced the natural spawn timing which now peaks in late October. Type N escapement in 1951 was estimated at ~2,500 adults, but current abundance is unknown, according to the Grays Coho SaSSI document (WDFW 2002).

Grays coho were identified as a stock based on their distinct spawning distribution and run timing. Most spawning takes place in lower river tributaries, with the natural population spawning from September to January. Current abundance of the natural population is unknown. Spawning takes place in all accessible locations in the basin with a substantial portion occurring in lower basin tributaries. According to the LCSRSP, natural production of Type N stock is likely <15% of the modeled smolt density estimate of 125,874 smolts.

2 Current Conditions

2.1 Current Population Status and Goals

At the time that the Lower Columbia Salmon Recovery and Subbasin Plan were written, coho were not listed under the ESA and so were not included in the Plan's recovery goals. A natural Grays Coho Type N population is documented in the LCSRSP and is combined with the Chinook River population for viability ratings and abundance goals. The WDFW SaSSI 2002 report indicates that a native population with later run timing than the hatchery population is still present in the system, but abundance data was not available at the time of the inventory. It was rated as depressed in the 1992 inventory with an unknown status in 2002.

- ESA Status: This population listed as Threatened.
- Population Description: Grays River coho are a Primary population.
- Current Viability Rating: Low, with a goal of High
- Recovery Goal for Abundance: 600, with a potential of 4,600
- Productivity Improvement Expectation: No productivity improvement expectation is provided by the LCSRSP. A 10% improvement in habitat is given for steelhead after implementation of the Recovery Plan. Until better data is available, assume that coho would experience the same 10% increase in habitat after implementation of the Plan.
- Habitat Productivity and Capacity (from EDT): Productivity 3.84; Capacity 1,623
- Hatchery Populations that Affect this Natural Population: Grays River Coho (Early Type S)

2.2 Current Hatchery Programs Affecting this Population

The only hatchery population of the same species that affects this population (e.g., through straying) is the Grays River coho (Early Type S) program. The Grays River Coho HGMP describes this program as integrated; however, only marked, hatchery origin fish are collected for broodstock. The intent has been to collect 707 broodstock at a 1:1 female to male ratio with a 1%

jack component for rearing and on-station release of 150,000 smolts and to transfer 220,000 to the Deep River Net Pens. Broodstock collections from 1990 through 2001 averaged 680 adults, with average on-station releases of 263,000 smolts and average releases from the Deep River net pens of 375,598 smolts. Currently, Type S broodstock collection takes place during October with volitional releases during late April and early May. For the on-station release, 20 percent are coded-wire tagged and the remainder are adipose clipped. For the Deep River Net Pen releases, 12.5 percent are coded-wire tagged and adipose clipped, with the remainder being only adipose clipped.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 225 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.6 to 3.1. Average abundance of natural-origin spawners (NOS) would increase from 549 to 988. Harvest contribution of the natural and hatchery populations would go from 511 to 235.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Grays River coho is considered a Primary population for recovery. This population has a natural spawning component (Type N), a segregated on-station component (Type S), as well as the segregated Deep River net pen program (Type S). There is a rack suitable for collecting early arriving coho, but it is not in place to collect late arrivals. It was noted, however, that the hatchery is on a different fork of the river than is used by this coho population.

Eliminating Grays Hatchery as the source of fish for the Deep River net pen production would result in fewer strays to Grays River.

Recommendations

All hatchery-origin fish need to be adipose fin-clip marked and the proportion of fish on the spawning grounds controlled at the hatchery intake weir. The water intake weir needs to be updated to better control fish access to spawning habitat and to protect the hatchery water supply.

The HSRG recommends that an integrated harvest program (155,000 fish release, tagged and a random portion of the population clipped for selective harvest) be developed for the native component (Type N coho).

Eliminate the use of Grays River hatchery to support the Deep River net pen program. Support for the Deep River program could be supplied from Elochoman or other WDFW facilities that rear Type S coho (Lewis or Toutle).

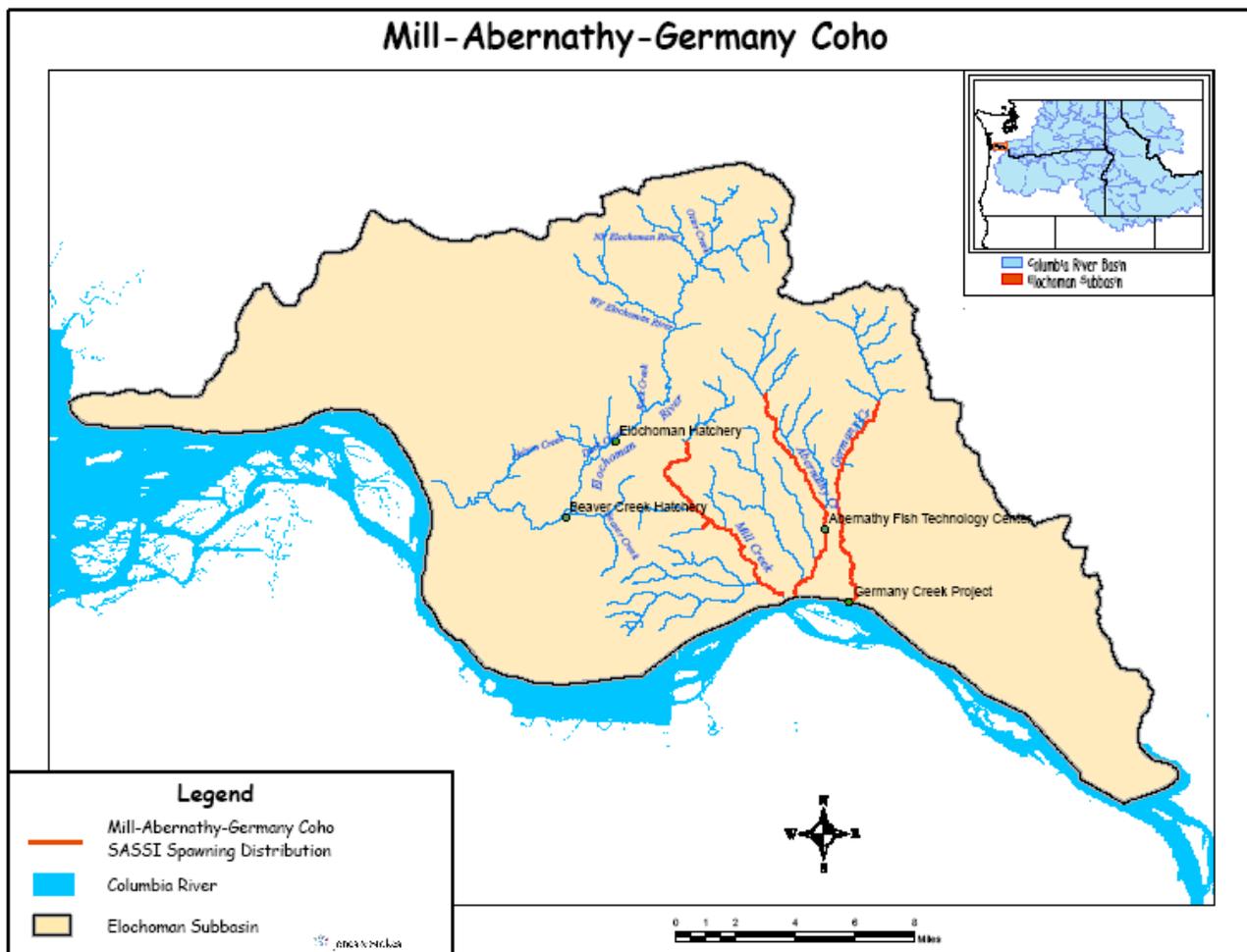
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Grays River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|--------------------------------------|--------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 25% | 0.00 | 549 | 1.6 | 131 | 0 |
| | Type S Seg Harv | 150.4 | 90% | | | | | | 380 | S |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 988 | 3.1 | 235 | - |
| HSRG Solution | Int Both | 155.9 | 20% | 90% | 3% | 0.87 | 912 | 3.0 | 2,390 | 507 |
| | Type S Seg Harv | - | 90% | | | | | | - | - |
| HSRG Solution w/ Improved Habitat | Int Both | 155.9 | 20% | 90% | 3% | 0.89 | 1,066 | 3.3 | 2,427 | 507 |
| | Type S Seg Harv | - | 90% | | | | | | - | - |

Hatchery Scientific Review Group Review and Recommendations

Mill, Abernathy and Germany Creeks Coho Population and Related Hatchery Programs

January 31, 2009



1 Columbia Estuary Mill-Abernathy-Germany Coho

The Mill Creek late coho population includes Mill (SaSSi# 3660), Abernathy (SaSSi# 3670), Germany (SaSSi# 3680) and Coal creek sub-populations. There is coho production in all three streams although there are no hatchery programs in these tributaries. The historical stock was principally late returning coho. Spawning generally occurs from October through February.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: This population is listed as threatened and is part of the Lower Columbia River Coho ESU.
- Population Description: Mill-Abernathy-Germany coho are a Stabilizing population.
- Recovery Goal for Abundance: unknown
- Productivity Improvement Expectation: unknown
- Habitat Productivity and Capacity (e.g., from EDT): Productivity 4.2; Capacity 2,596
- Populations Affected by this Hatchery Program Include: NA

2.2 Current Hatchery Programs Affecting this Population

- There are no hatchery programs in this watershed.
- Modeling indicates hatchery strays from nearby hatchery programs may be affecting this population.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 52 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 3.2 to 4.0. Average abundance of natural-origin spawners (NOS) would increase from 1,557 to 1,852. Harvest contribution of the natural and hatchery populations would go from 264 to 314.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated a contributing population that appears to be productive and abundant. It appears to meet the standards as a primary population.

Recommendations

The HSRG recommends that this population be managed for natural production. Actions should be focused on habitat protection. Continue removing marked hatchery coho at the Abernathy weir.

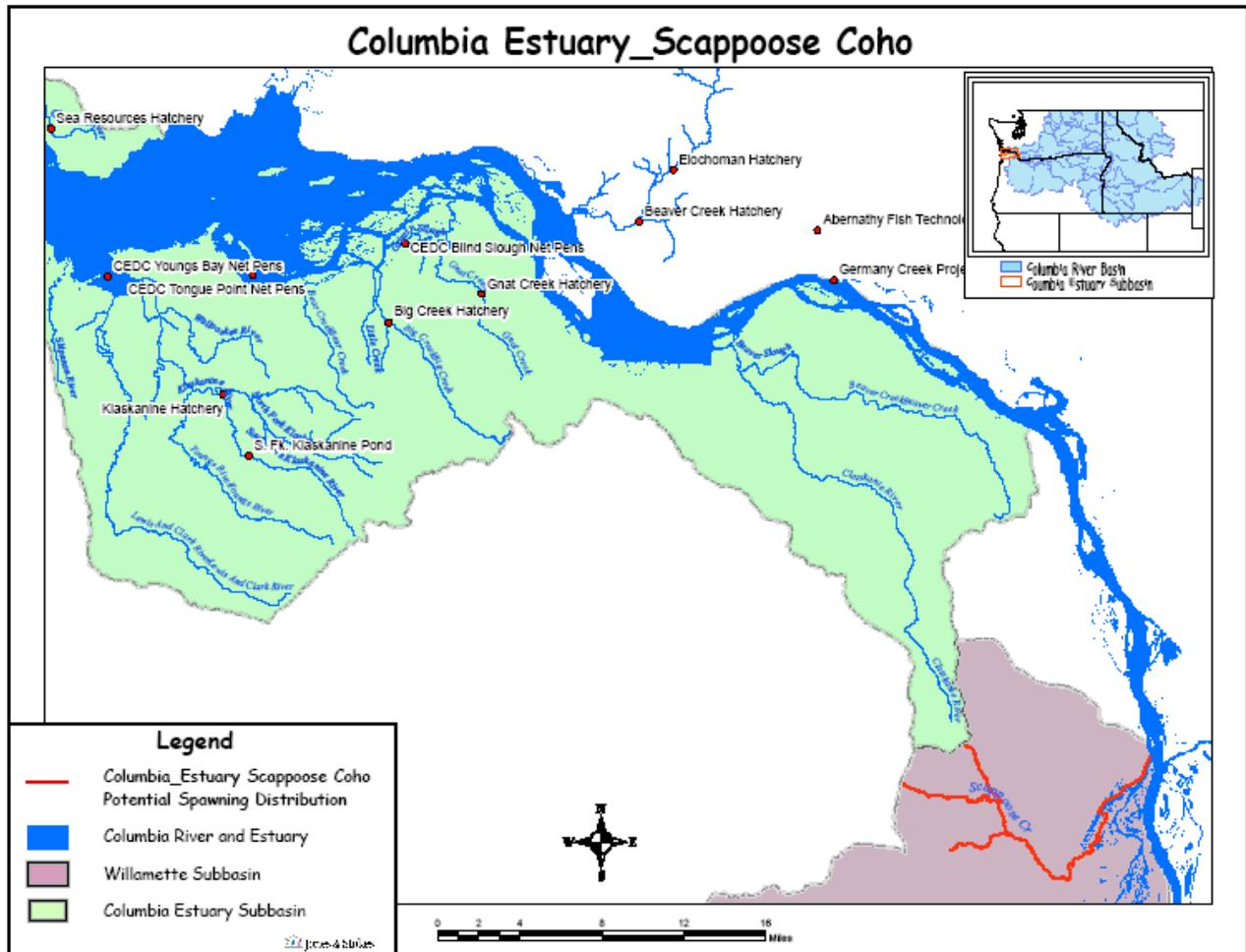
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Mill, Abernathy and Germany Creeks Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 3% | 0.00 | 1,557 | 3.2 | 264 | 0 |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 1,852 | 4.0 | 314 | - |
| | None | | | | | | | | | |
| HSRG Solution | None | - | 0% | 0% | 2% | 0.00 | 1,629 | 3.4 | 279 | 0 |
| | None | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None | - | 0% | 0% | 2% | 0.00 | 1,902 | 3.9 | 326 | 0 |
| | None | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Scappoose Creek Coho Population and Related Hatchery Programs

January 31, 2009



1 Scappoose Creek Coho

The Scappoose coho population includes the Tide, Goble, Milton, McNulty and Scappoose creek sub-populations. The population is believed to be at low abundance and has likely dropped to double or single digits in the recent past. Coho salmon in the lower Columbia generally enter the Columbia River beginning in September, with peak spawn timing generally in late November and December.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: This population is listed as threatened and is part of the Lower Columbia River Coho ESU.
- Population Description: Scappoose coho is a Primary population.
- Recovery Goal for Abundance: Unknown
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity: Productivity: 4.0; Capacity: 400
- Populations Affected by this Hatchery Program Include: Not applicable

2.2 Current Hatchery Programs Affecting this Population

- No coho hatchery programs are operating in the watersheds that make up the Scappoose population.
- Modeling indicates hatchery strays from the nearby hatchery programs may be affecting this population. Under the current scenario, pHOS is estimated at 32 percent even though no hatchery coho are released in Scappoose Creek.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 97 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly

greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.7 to 3.4. Average abundance of natural origin spawners (NOS) would increase from approximately 165 fish to 268 fish. Harvest contribution of the natural and hatchery populations would go from approximately 28 fish to approximately 45 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Given the habitat information provided, it does not appear that there is potential for this population to achieve the abundance standards of a Primary designation. This population could contribute to recovery as a stabilizing population. No coho hatchery programs operate within the watershed.

Recommendations

The HSRG recommends that managers review the current Primary designation of this population.

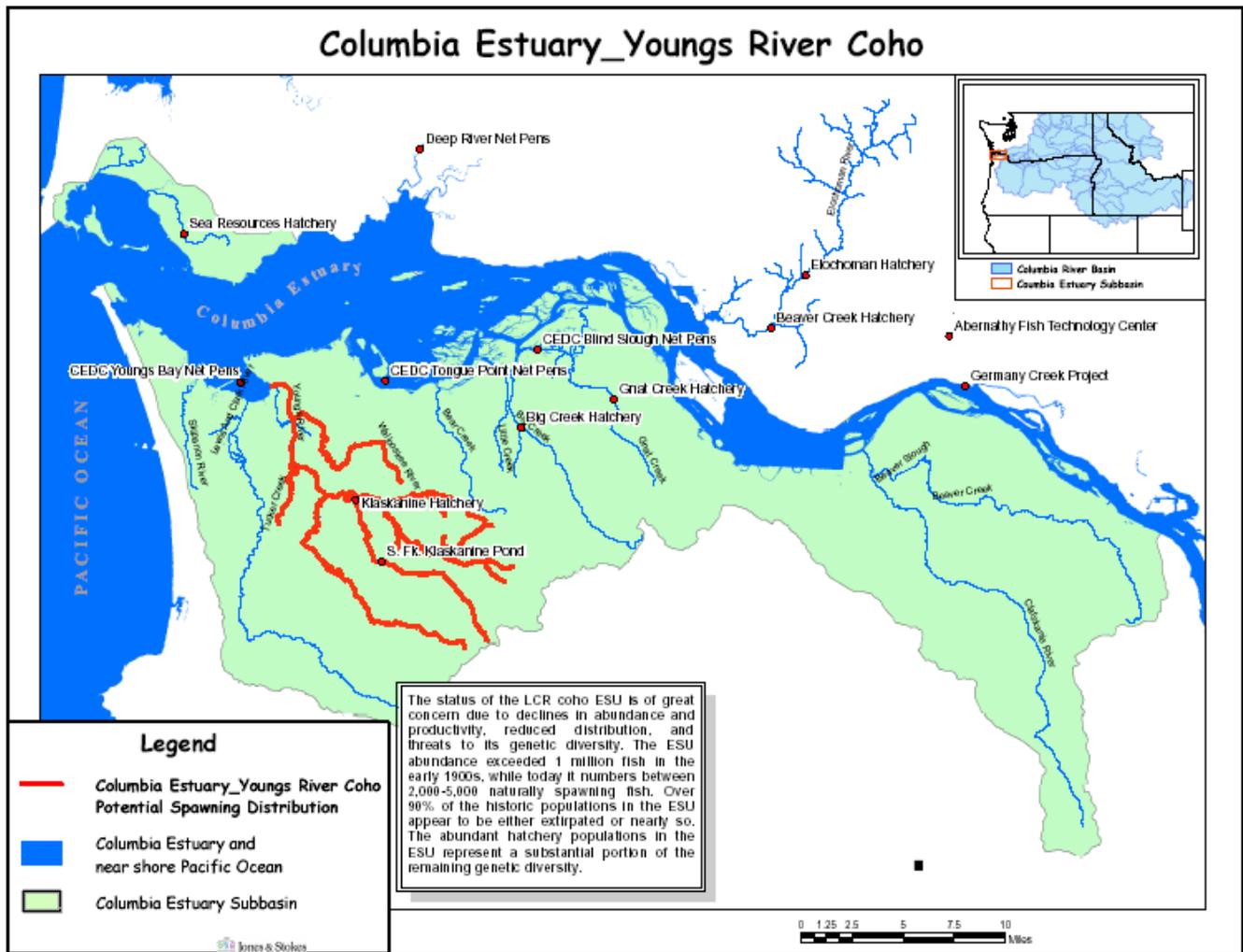
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Scappoose River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | | | | | | | | | |
| | None | - | 0% | 0% | 32% | 0.00 | 165 | 1.7 | 28 | 0 |
| No Hatchery | None | | | | | | | | | |
| | None | - | 0% | 0% | 0% | 1.00 | 268 | 3.4 | 45 | - |
| HSRG Solution | None | | | | | | | | | |
| | None | - | 0% | 0% | 18% | 0.00 | 145 | 1.7 | 25 | 0 |
| HSRG Solution w/ Improved Habitat | None | | | | | | | | | |
| | None | - | 0% | 0% | 16% | 0.00 | 170 | 1.9 | 29 | 0 |

Hatchery Scientific Review Group Review and Recommendations

Columbia Estuary - Youngs Bay Tributaries Coho Population and Related Hatchery Programs

January 31, 2009



1 Columbia Estuary - Youngs Bay Tributaries Coho

The Columbia Estuary Youngs Bay Tributaries Coho population is a natural component of the Lower Columbia River Coho ESU. No major hatchery programs operate in the tributaries (small releases of coho for education purposes occur); however, Select Area Net Pen projects operate in the Youngs Bay area. Little information is available to describe population status and trend for Youngs or Klaskanine river coho salmon.

2 Current Conditions

2.1 Current Population Status and Goals

- ESA Status: This population is listed as threatened and is part of the Lower Columbia River Coho ESU.
- Population Description: Youngs Bay Tributary coho are a Stabilizing population.
- Current Viability Rating: Very Low
- Recovery Goal for Abundance: Not defined
- Productivity Improvement Expectation: Not defined
- Habitat Productivity and Capacity: Productivity: 4.0; Capacity: 400
- Populations Affected by this Hatchery Population: No hatchery program is associated with this natural population.
- Hatchery Populations of the Same Species That Affect this Population: Hatchery populations in the Lower Columbia River Coho ESU that could adversely affect this population (primarily through straying) include the Columbia Estuary Select Area Fishery Enhancement (SAFE) Program, the Bonneville Hatchery program, and releases from Grays River and Elochoman River programs.

2.2 Current Hatchery Programs Affecting this Population

No coho hatchery program currently operates in the Youngs Bay Tributaries; however, coho salmon from other programs stray into the Youngs Bay tributaries. About 51 adult coho are estimated to stray into this system annually. Under the current scenario, pHOS is estimated at 22% even though no hatchery coho are released in Youngs Bay tributaries. Annually, approximately 150 natural-origin adults are estimated to return to the basin.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 51 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions,

not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.7 to 3.4. Average abundance of natural-origin spawners (NOS) would increase from 147 to 264 fish. Harvest contribution of the natural population would go from 27 to 48 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated stabilizing and has no hatchery program. The largest tributary in Youngs Bay, Klaskanine River, is flow-limited in the summer; therefore, it offers limited potential for year-round rearing. There may be potential however to use this site for over-winter rearing and release of additional coho production for harvest.

Recommendations

The HSRG recommends that this population continue to be managed for natural production as a stabilizing population. Focus actions on habitat protection and improvement that will increase productivity and capacity of the system.

Consider over-winter rearing and releasing of up to an additional one million coho smolts for harvest from the Youngs Bay Net Pens.

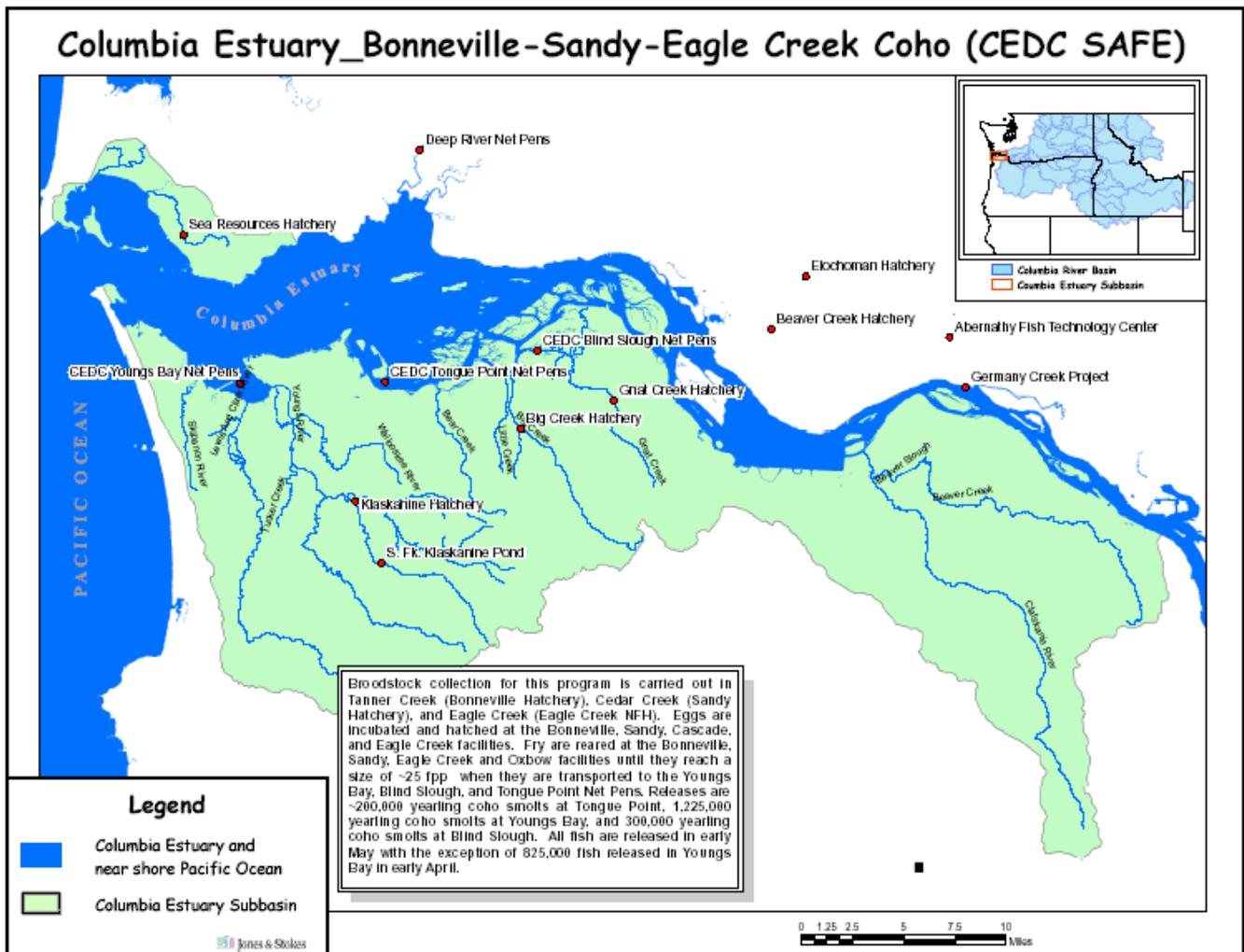
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Youngs Bay Tributary Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 22% | 0.00 | 147 | 1.7 | 27 | 0 |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 264 | 3.4 | 48 | - |
| | None | | | | | | | | | |
| HSRG Solution | None | - | 0% | 0% | 26% | 0.00 | 152 | 1.7 | 28 | 0 |
| | None | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None | - | 0% | 0% | 23% | 0.00 | 175 | 1.9 | 32 | 0 |
| | None | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Columbia Estuary – Young Bay Net Pens Bonneville-Sandy-Eagle Creek Coho (CEDC SAFE) Population and Related Hatchery Programs

January 31, 2009



1 Columbia Estuary – Youngs Bay Net Pens Bonneville-Sandy-Eagle Creek Coho (CEDC SAFE)

The Select Area Fisheries Enhancement (SAFE) Project uses lower Columbia River coho salmon *Oncorhynchus kisutch*. Stock 14 (Bonneville/Cascade/Oxbow) and stock 11 (Sandy) are used in this program. USFWS Eagle Creek Hatchery stock was used in this program from 1992 through 2004 (final releases of brood year 2002 smolts occurred in 2004). Funding comes from the Mitchell Act and Clatsop Economic Development Council (CEDC) for rearing and acclimation of coho. Approximately 60%, 30%, and 10% of CEDC's funding comes from the BPA Fish and Wildlife Program, ODFW, and commercial fishing interests, respectively.

2 Current Conditions

2.1 Current Population Status and Goals

The program goal is to mitigate for the loss of coho salmon catch in Oregon commercial troll, Oregon ocean recreational, and Columbia River mainstem commercial and recreational fisheries due to loss of habitat and passage loss and/or degradation in the Columbia River Basin.

- ESA Status: This is a segregated hatchery population.
- Population Description: This is a segregated hatchery population.
- Current Viability Rating: Not applicable
- Recovery Goal for Abundance: Not applicable
- Productivity Improvement Expectation: Not applicable
- Habitat Productivity and Capacity: Not applicable
- Populations Affected by this Hatchery Population Include: Winter steelhead (Scappoose/Clatskanie), winter steelhead (Youngs Bay), fall Chinook (Sea Resources), and early coho (Sea Resources). Additionally, coho releases from this program could potentially impact other populations within the Lower Columbia River steelhead DPS, Lower Columbia River Chinook ESU, and the Columbia River chum ESU. Straying of SAFE net pen coho has not been quantified in detail. It is generally accepted that some level of risk to other populations does exist as a result of net pen fish straying to lower Columbia River tributary systems.
- Hatchery Populations of the Same Species that Affect this Population: Big Creek coho program and potentially releases from Grays River, Sea Resources early coho program in the Chinook River, and the Elochoman River program.

2.2 Current Hatchery Programs Affecting this Population

Coho broodstock for the SAFE program are collected at the Bonneville and Sandy fish hatcheries. Through brood year 2002, broodstock was also collected at the Eagle Creek National Fish Hatchery. Eggs are incubated and hatched at Bonneville, Sandy and Cascade facilities. Fry are reared at Bonneville, Sandy, and Oxbow facilities until a size of approximately 25 fpp. They are then transported to the Youngs Bay, Blind Slough, and Tongue Point net pens. Releases are roughly 200,000 yearlings to Tongue Point, 1,225,000 to Youngs Bay and 300,000 to Blind Slough. The current hatchery program is a segregated-harvest program. No natural-origin river population is directly associated with this program.

Up to 80,000 coho were harvested annually between 1996 and 2002 (combined Youngs Bay, Tongue Point, and Blind Slough locations). Since 2005, harvest has been lower due to the loss of smolt production from the Eagle Creek National Fish Hatchery (smolt production for the SAFE program was cut by approximately one million smolts annually).

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Since this is a segregated hatchery population, the No Hatchery scenario would have no impact on the adjusted productivity or natural-origin spawners. Harvest contribution of the hatchery population would go from approximately 24,153 fish to zero under the No Hatchery scenario.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is a candidate location to increase releases of coho for harvest. For this program to be successful, a high harvest rate is critical to control straying into natural populations. For this reason, contribution to natural populations should be monitored. If the assumed 97% harvest rate is not achievable or maintained, strays may put the neighboring natural populations at increased risk.

Recommendations

The HSRG recommends maintaining or expanding coho production to pre-2004 levels (2.7 million smolts) using 500,000 coho from Bonneville and another 500,000 from a suitable donor stock. Increase production beyond 2.7 million only after confirming that risks to natural populations have been addressed.

Refine straying estimates for this program and work to balance risks associated with straying as management decisions are developed. Monitor impact of fisheries associated with this program on important natural populations as well as harvest rates on the target hatchery population.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Youngs Bay Net Pens; Bonneville, Sandy and Eagle Creek Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 1,726.2 | 0% | | | | | | 24,153 | 0 |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 2,701.9 | 0% | | | | | | 37,948 | 0 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 2,701.9 | 0% | | | | | | 37,948 | 0 |

1 Fifteenmile Creek Coho

Coho have been documented to spawn in the lower part of Fifteenmile Creek below and just above Seufert Falls. They are thought to spawn only in Mill Creek and the mouths of Fifteenmile, Threemile, Chenowith, Mosier and Rock creeks. Fifteenmile coho were not selected as a focal species by Subbasin Plan authors because the authors did not believe that the population was native to the subbasin. Coho would have difficulty completing their juvenile freshwater rearing in this portion of the stream (Fifteenmile Subbasin Plan 2004).

From 1998 to 2000, ODFW maintained a screw trap near the mouth of Fifteenmile Creek to monitor out-migrating smolts. The screw trap was operated again in 2003 jointly by US Forest Service and ODFW. Coho juvenile migrants were captured in 1998 and 2003. In each year, two juveniles were captured. In 1999 and 2000, no coho were captured at the screw trap (Fifteenmile Subbasin Plan 2004).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Fifteenmile coho are not included as a part of any ESU. The eastern-most portion of the Lower Columbia Coho ESU is found in the Hood River subbasin immediately to the west of the Fifteenmile Creek subbasin.
- Population Designation: Unknown
- Current Viability Rating: Unknown
- Recovery Goal for Abundance: Unknown
- Habitat Productivity and Capacity: Productivity: 1.5; Capacity: 100
- Productivity Improvement Expectation: Unknown

2.2 Current Hatchery Programs Affecting this Population

No Coho hatchery programs are currently operating in this subbasin.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 59 fish that represent an estimated 62% of the spawning population.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed

pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.3. Average abundance of natural-origin spawners (NOS) would decrease from approximately 29 fish to approximately 18 fish. Harvest contribution of the natural and hatchery populations would go from approximately 5 fish to approximately 3 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

No coho hatchery programs are currently operating in this subbasin. Habitat limitations are the primary concern for this population.

Recommendations

The HSRG recommends that this population continue to be managed for natural production. Focus actions on habitat protection that will improve productivity and capacity of the system.

Monitor the contribution of hatchery strays from nearby hatchery programs.

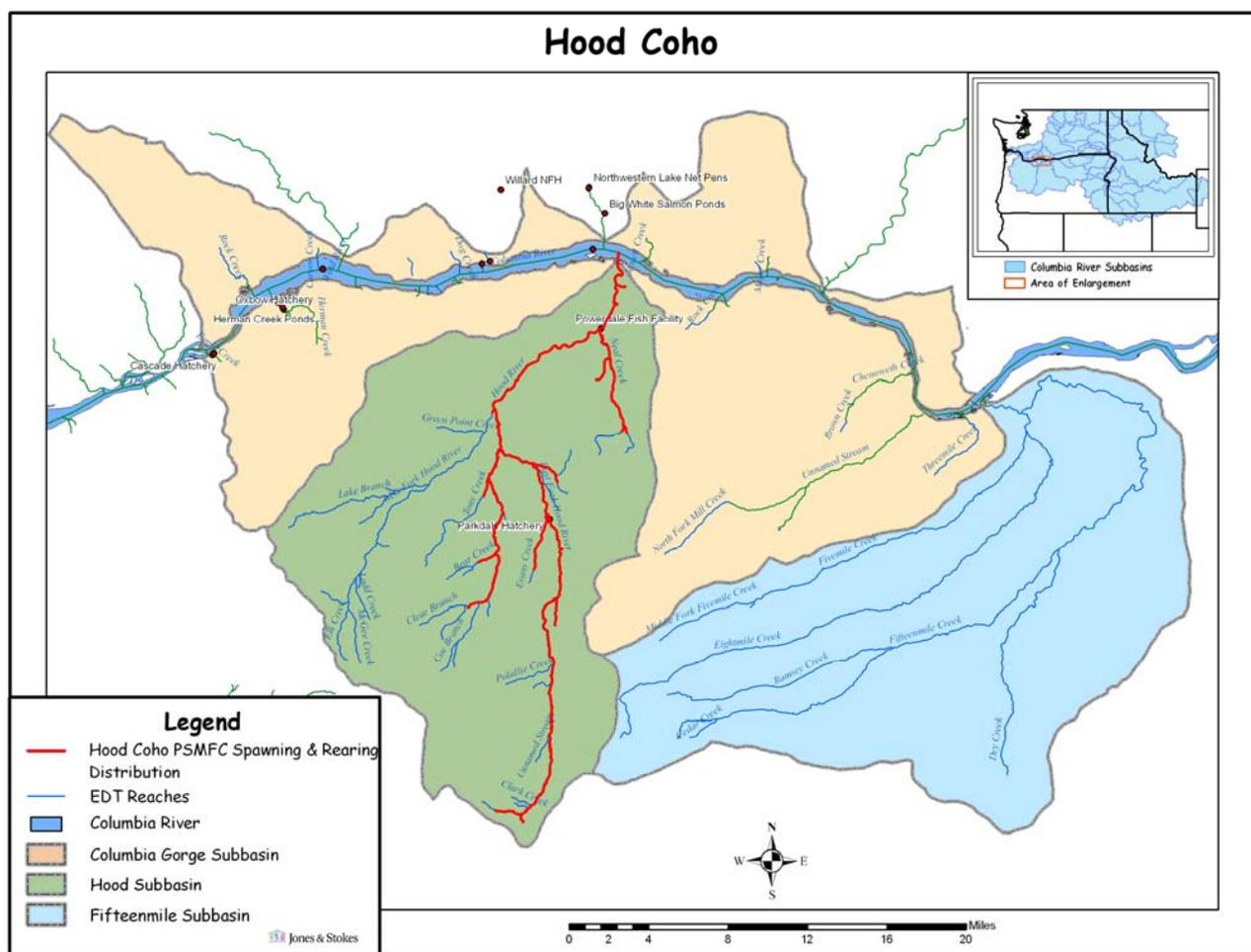
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Fifteen Mile Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 62% | 0.00 | 29 | 0.6 | 5 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 18 | 1.3 | 3 | - |
| HSRG Solution | None None | - | 0% | 0% | 43% | 0.00 | 12 | 0.6 | 2 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 39% | 0.00 | 15 | 0.7 | 3 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Hood River Coho Population and Related Hatchery Programs

January 31, 2009



1 Hood River Coho

Coho are indigenous to the Hood River subbasin. They are found throughout the basin except for the West Fork Hood River above the Punchbowl Falls (impassable barrier). Run-timing data suggests that Hood River coho are an early returning Type S population, with peak passage past Powerdale Dam in September and October (Howell et al. 1985, Olsen et al. 1992).

Coho counted at the Powerdale Dam fish ladder in 2002 and 2003 numbered 27 and 31, respectively. Powerdale Dam is currently located at ~RM 4.0 but may be removed by PacifiCorp in 2010.

NOAA estimates that 100 percent of the 35 river miles of potential historic coho spawning habitat are still intact (NOAA 2005). Currently 66.8 miles of habitat in the Hood River subbasin are designated as coho spawning and rearing habitat (PSFMC GIS data 2007).

About 0.25 mile of spawning habitat for steelhead and coho salmon was inundated by the construction of Clear Branch Dam in 1965, eliminating the native coho salmon population in the Middle Fork Hood River.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Hood River coho are part of the Lower Columbia River Coho ESU, listed as Threatened under the ESA in 2005.
- **Population Designation:** The Hood River coho population is designated as a Contributing population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004).
- **Current Viability Rating:** The LCSR&SP describes current viability as Unknown with a viability goal of Medium.
- **Recovery Goal for Abundance:** Unknown
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity:** Productivity: 1.5; Capacity: 100

2.2 Current Hatchery Programs Affecting this Population

No coho hatchery programs are currently operating in the Hood River subbasin and no releases have occurred since 1977. Hatchery coho juveniles were released in 1967, 1971 and 1977 in numbers ranging from 230,000 to 970,000 fish. An early release was made in 1958 in Lost Lake. Between 225 and 1,480 adult coho from the Bonneville Hatchery were released into Clear Branch and Neal Creek and the East and Middle Forks of the Hood River in 1966, 1968, and 1970 (Hood Subbasin Plan 2004).

Estimated number of hatchery strays affecting this population:

- **Hatchery strays from in-basin segregated and out-of-basin hatchery programs:** 82 fish, estimated to make up 66% of the natural spawning population.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.3. Average abundance of natural origin spawners (NOS) would decrease from approximately 34 fish to approximately 18 fish. Harvest contribution of the natural and hatchery populations would go from approximately 6 fish to 3 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

No coho hatchery programs are currently operating in the Hood River subbasin and no releases have occurred since 1977. This population has been designated a Contributing population. Few natural or hatchery-origin fish are observed at Powerdale Dam. It is unclear whether habitat exists to sustain a natural coho population. It is unclear if this population has the potential to meet the standards for a Contributing population designation.

Recommendations

Although the HSRG did not preclude the possibility, we did not consider this a candidate for coho reintroduction because of evidence that indicates low production of coho from adult spawners in the basin. Habitat improvements may make a difference.

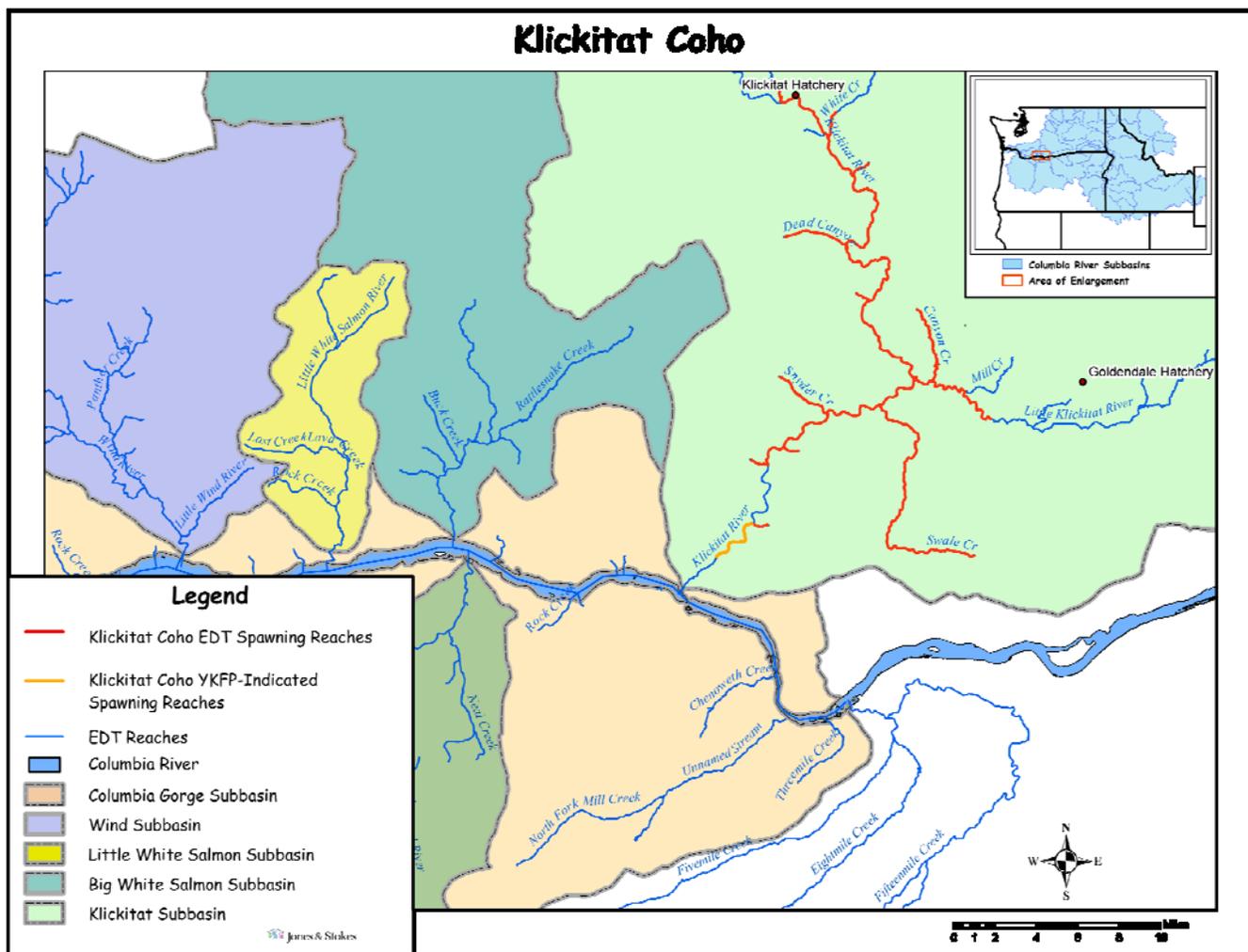
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Hood River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 66% | 0.00 | 34 | 0.6 | 6 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 18 | 1.3 | 3 | - |
| HSRG Solution | None None | - | 0% | 0% | 45% | 0.00 | 14 | 0.6 | 3 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 42% | 0.00 | 17 | 0.7 | 3 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Klickitat River Coho Population and Related Hatchery Programs

January 31, 2009



1 Klickitat Coho

Coho are not a native species in the Klickitat subbasin. Lyle Falls was a barrier to coho adults. The naturally spawning population of coho is believed to have originated from the hatchery programs that have operated in the subbasin since the construction of the Klickitat Hatchery in 1950. Coho hatchery releases have resulted in a small population of naturally spawning fish. Spawning occurs between RM 5.2 and RM 42.0 on the mainstem. Tributary spawning occurs in Summit, White, and Swale creeks and in the lower Little Klickitat. Peak spawning occurs in October. Spawner surveys are not prolific but surveys from 1997-1999 indicated a naturally spawning population of ~500 adults.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Naturally spawning coho in the Klickitat system are not included as part of any ESU and so are not listed under the ESA.
- Population Designation: This population has no designation.
- Current Viability Rating: Unknown
- Recovery Goal for Abundance: Unknown
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity (from EDT): Productivity: 2.4, Capacity: 1,172

2.2 Current Hatchery Programs Affecting this Population

Two segregated harvest programs currently produce coho for release into the Klickitat subbasin.

Type N Lewis stock collected at the Washougal Hatchery are spawned, hatched, and reared at the Washougal Hatchery until they reach a size of 20 fpp. Up to 2,500,000 yearlings, at an average size of 19.6 fpp (1992-2003 average) are trucked in early April from the Washougal Hatchery for release at RM 12 and 29 in the Klickitat River.

Type N Lewis Stock is also collected from the Lewis River at the Lewis River Hatchery where they are spawned and incubated until eyed. Coho are stripped of gametes, eggs and milt are transferred to the Washougal Hatchery where they are fertilized and incubated until eyed. As of 2006, PacifiCorp will no longer take eggs to eye stage for the Klickitat at Lewis River. Up to 1,500,000 eyed eggs are transferred for rearing and release at the Klickitat Hatchery. Releases from 1996 to 2003 averaged 1,205,000 yearlings (ranging from 998,900 to 1,469,000) at an average size of 16.5 fpp (ranging from 13.4 to 19.1 fpp).

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 1,306 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.2 to 0.3. Average abundance of natural-origin spawners (NOS) would decrease from 76 to 1. Harvest contribution of the natural and hatchery populations would go from 15,727 to 2.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Coho are not native to the Klickitat upstream of Lyle Falls and there are no natural production objectives. The purpose of the Klickitat coho programs is to produce fish for harvest. The

current goal is to maintain recent harvest levels across all fisheries. Broodstock for these programs are from out-of-basin hatchery programs. The infrastructure does not exist to collect broodstock returning to the basin or acclimate the entire release.

The current program has potential ecological effects because it uses coho that are non- native, the size of program, and direct stream release and location. Direct stream releases from the Washougal program are resulting in high stray rates, poor survival and low contribution to fisheries. There may be opportunities to reduce ecological risks, reduce straying, and improve the contribution to fisheries.

Recommendations

The HSRG recommends moving towards collecting broodstock from returns to the Klickitat subbasin and developing infrastructure in the lower river to acclimate all coho prior to release. Together these measures should improve survival, reduce ecological effects, and improve the contribution to fisheries. Managers may be able to reduce the size of the programs and still achieve harvest objectives, if survival increases as expected.

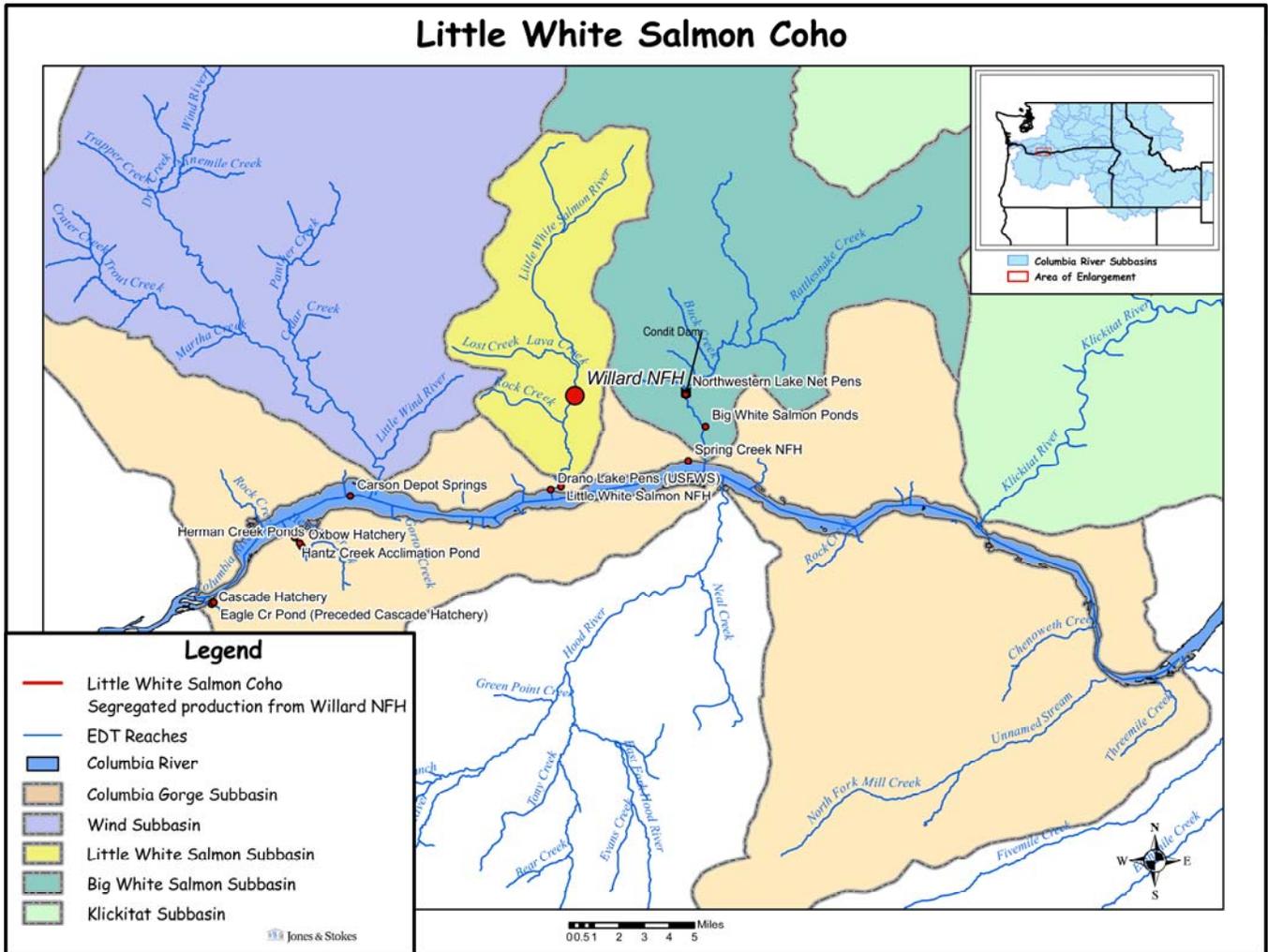
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Klickitat River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-----------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 93% | 0.00 | 76 | 0.2 | 480 | 0 |
| | Washougal Hatchery Seg Harv | 2,462 | 0% | | | | | | 5,916 | 1 |
| | Lewis Hatchery Seg Harv | 1,239 | 0% | | | | | | 9,403 | 0 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1 | 0.3 | 2 | - |
| HSRG Solution | None None | - | 0% | 0% | 84% | 0.00 | 19 | 0.2 | 123 | 0 |
| | Washougal Hatchery Seg Harv | - | 0% | | | | | | - | - |
| | Klickitat Hatchery Seg Harv | 1,052 | 90% | | | | | | 16,601 | 419 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 82% | 0.00 | 22 | 0.2 | 137 | 0 |
| | Washougal Hatchery Seg Harv | - | 0% | | | | | | - | - |
| | Klickitat Hatchery Seg Harv | 1,052 | 90% | | | | | | 16,601 | 419 |

Hatchery Scientific Review Group Review and Recommendations

Little White Salmon River Coho Population and Related Hatchery Programs

January 31, 2009



1 Little White Salmon Coho

There is no naturally reproducing population of coho in the Little Salmon River. An impassable falls immediately upstream from the Little White Salmon National Fish Hatchery (NFH) site in the lower Little White Salmon River precludes anadromous fish passage into the upper basin. There is very little, if any, productive spawning habitat below Little White Salmon NFH at the mouth of the Little White Salmon River (Drano Lake). Historic coho habitat was inundated by Bonneville Pool in 1938 (Bryant 1949).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: The Little White Salmon -Wind River coho are part of the Lower Columbia River Coho ESU, which was listed as Threatened under the ESA in 2005.
- Population Description: The Little White Salmon coho population is not designated by the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004).
- Recovery Goal for Abundance: Unknown
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity (e.g., from EDT): Productivity: 0; Capacity: 0

2.2 Current Hatchery Programs Affecting this Population

The Little White Salmon River coho hatchery program was discontinued in 2004. For many years prior to 2004, approximately one million coho were released on-station from broodstock collected at the hatchery. Currently the hatchery is used to support coho reintroduction in the Wenatchee River.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: N/A

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly

greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

There is no natural population here.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The hatchery program was eliminated in 2004.

Recommendations

Managers might consider establishing net pens to acclimate hatchery coho in Drano Lake to provide additional harvest to ocean and Zone 1-6 fisheries. A new terminal fishery for tribal and sport fishermen could be created with little potential conflict with natural populations. Coho transferred to the net pens could come from multiple sources.

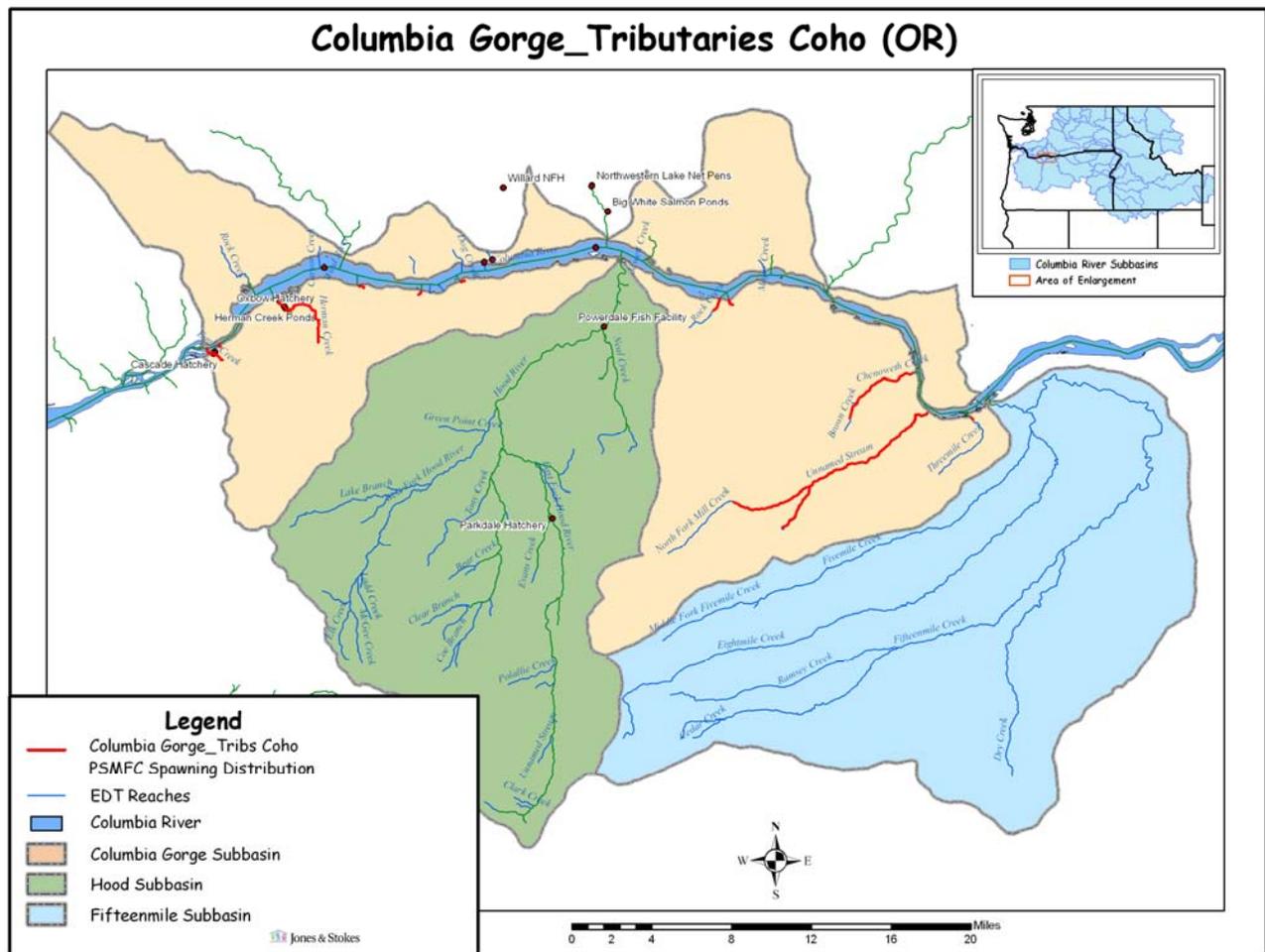
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Little White Salmon River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | - | 90% | | | | | | - | - |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg None | 1,059 | 90% | | | | | | 19,657 | 1,103 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg None | 1,059 | 90% | | | | | | 19,657 | 1,103 |

Hatchery Scientific Review Group Review and Recommendations

Lower Columbia Gorge Oregon Tributaries Coho Population and Related Hatchery Programs

January 31, 2009



1 Columbia Gorge Tributaries Coho (Oregon)

This coho population includes the Herman Creek, Gorton Creek, Viento Creek, Lindsey Creek and Phelps Creek sub-populations. Recent coho spawner surveys estimated that Gorge tributaries on the Oregon side have 11 miles of coho spawning habitat (Suring et al. 2005). This estimate does not include habitat above weirs on Eagle and Tanner creeks, nor does it include habitat that was lost by filling Bonneville Pool. Culverts along Interstate 84 also may limit current accessible habitat. Geographically, the majority of the tributaries in this area, with the exception of the Hood River, are very short and may have historically only contained a few hundred meters of usable habitat.

Estimates by Maher et al. (2005) indicate that the Oregon tributaries to the upper Gorge (excluding the Hood River) historically contained 11 km of coho spawning and rearing habitat. Based on the opinion of ODFW biologists and the absence of historical information on the abundance of coho in this area, the TRT determined that (at a minimum) a combination of upper Gorge tributaries in addition the Hood River provided sufficient habitat and geographical structure to support a demographically independent population (Hist. Pop. Structure of the Willamette and LCR 2006).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Coho spawning in the minor tributaries to the Columbia Gorge are part of the Lower Columbia Coho ESU which was listed as Threatened under the ESA in 2005.
- Population Designation: Unknown
- Current Viability Rating: Unknown
- Recovery Goal for Abundance: Unknown
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity: Productivity: 1.5; Capacity 100

2.2 Current Hatchery Programs Affecting this Population

No coho hatchery program currently operates these tributaries; however, about 100 adult coho from other programs are estimated to stray into this system annually. Under the current scenario, pHOS is estimated at 65% even though no hatchery coho are released.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 102 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning

population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.8 to 1.5. Average abundance of natural-origin spawners (NOS) would decrease from approximately 45 fish to 37 fish. Harvest contribution of the natural and hatchery populations would go from approximately 12 fish to 9 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Recommendations

The HSRG does not have any specific recommendations for this population.

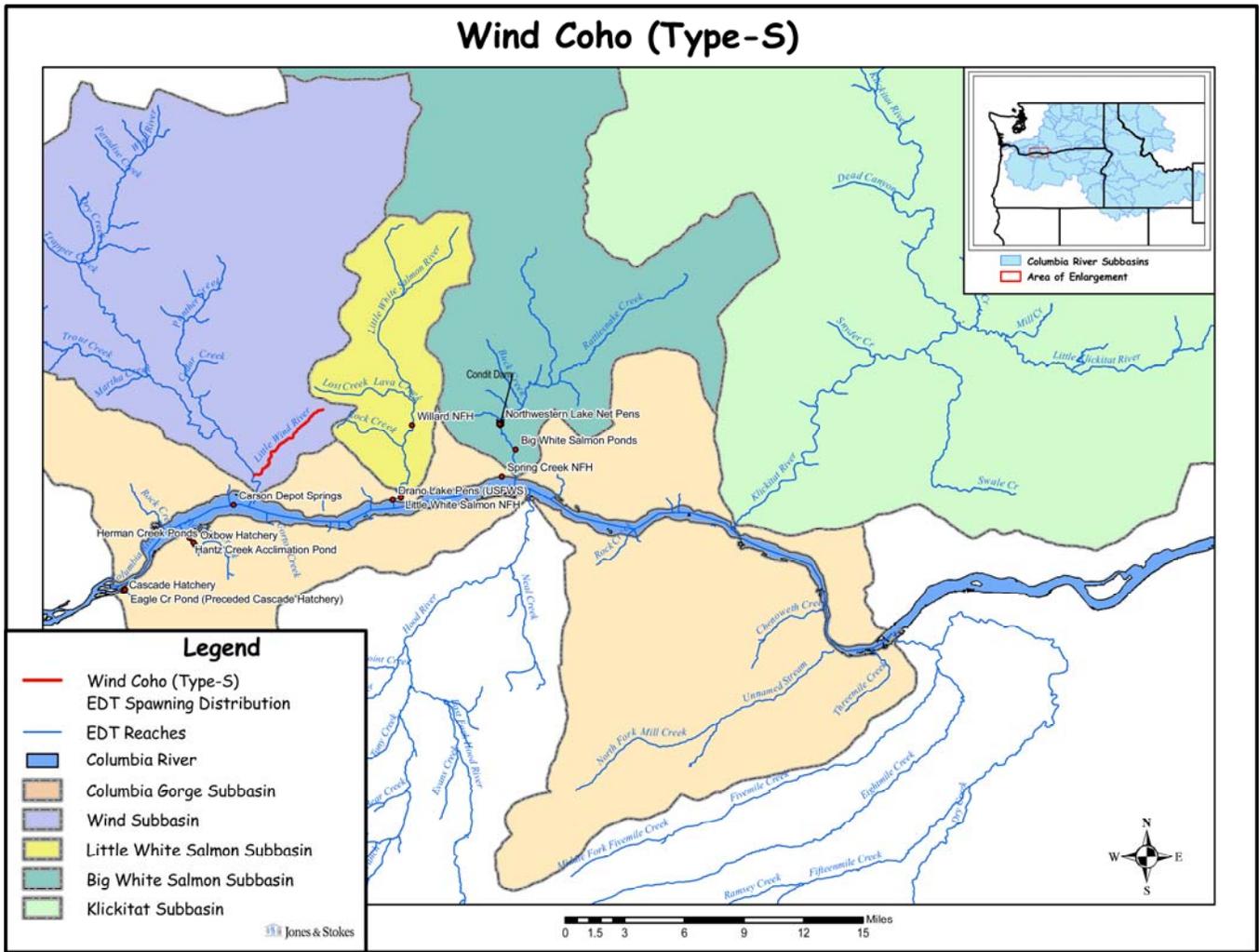
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Lower Columbia Gorge Tributaries Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 65% | 0.00 | 45 | 0.8 | 12 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 37 | 1.5 | 9 | - |
| HSRG Solution | None None | - | 0% | 0% | 40% | 0.00 | 21 | 0.8 | 6 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 37% | 0.00 | 25 | 0.8 | 7 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Upper Gorge Tributaries (WA) Coho Population and Related Hatchery Programs

January 31, 2009



1 Upper Gorge Tributaries (WA) Coho Salmon

Wind River coho are found primarily in the Little Wind River below Shipherd Falls. Coho do not pass upstream of Shipherd Falls (D. Rawding, WDFW, personal communication). A natural coho stock has not been identified in the Wind River (WDFW 2002 SASSI). Myers et al. (2006) mentioned Wind River coho in the DIP delineation of lower Columbia River Gorge tributaries (Big White Salmon River, Wind River, Spring Creek, and Little White Salmon River) early run (Type S) coho on the Washington side. Historic coho escapement in the Wind River was approximately 1,200 to 10,000 adults (Subbasin Plan 2004). Currently, escapement is estimated to be 200 to 300 adults. Coho productivity has declined by 47%. The current coho diversity index is 19% of the historical level, while coho smolt productivity has decreased by 88% of historical levels. Historical-to-current change in coho smolt abundance shows a 90% decline.

In the past, Little White Salmon Hatchery coho may have affected Wind River coho; however, this program was discontinued in 2004 because of funding issues. The Biological Review Team conclusions for the Lower Columbia River coho ESU indicated that the ESU is at a moderately high risk for all viable salmon population categories: abundance (4.4), growth rate/productivity (4.2), spatial structure and connectivity (4.2), and diversity (4.5)(SR 2005). The most serious overall concern was the scarcity of naturally produced spawners throughout the ESU, with attendant risks associated with a small population, loss of diversity, and fragmentation and isolation of the remaining naturally produced fish. In the only two populations with significant natural production (Sandy and Clackamas rivers), short- and long-term trends are negative, and productivity (as gauged by pre-harvest recruits) is down sharply from recent (1980s) levels.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- **ESA Status:** Wind River coho are part of the Lower Columbia River Coho ESU, which was listed as Threatened under the ESA in 2005.
- **Population Description:** The Wind River coho population is designated as a Primary population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). They are part of the Upper Gorge tributaries, of which the Wind River is the largest. The LCSR&SP describes current viability as Low with a viability goal of High.
- **Recovery Goal for Abundance:** 600
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (e.g., from EDT):** Productivity: 3.2; Capacity: 138

2.2 Current Hatchery Programs Affecting this Population

There are no hatchery programs in the subbasin. Straying of Little White Salmon Hatchery coho may affect Wind River coho. The purpose of the segregated harvest program in the Little White Salmon is to successfully rear and release 1,000,000 locally-adapted yearling Type S coho salmon smolts for release on-station to mitigate for mainstem hydropower project construction

and other development (HGMP 2004, Subbasin Plan 2004). The Little White Salmon program was discontinued in 2004 because of funding issues.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 170 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects. Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.7 to 2.8. Average abundance of natural-origin spawners (NOS) would increase from 46 to 87. Harvest contribution of the natural and hatchery populations would go from 11 to 21.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases, more than one solution is described.

Recommendations

The HSRG has no specific recommendations for this population.

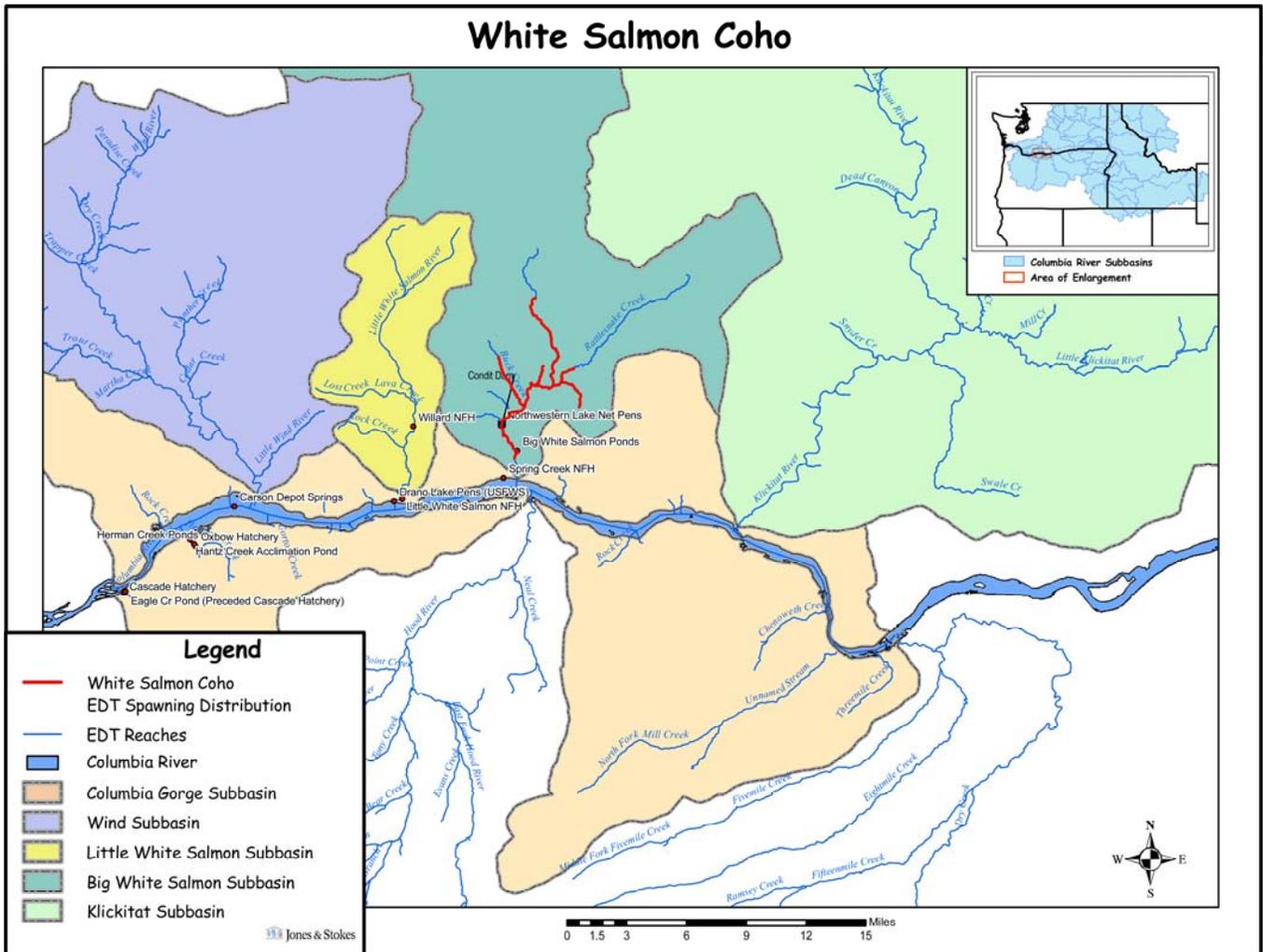
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Upper Gorge Tributaries (WA) Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 75% | 0.00 | 46 | 0.7 | 11 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 87 | 2.8 | 21 | - |
| HSRG Solution | None None | - | 0% | 0% | 49% | 0.00 | 28 | 0.8 | 7 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 46% | 0.00 | 33 | 0.9 | 8 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

White Salmon River Coho Population and Related Hatchery Programs

January 31, 2009



1 White Salmon Coho (Early- Type S)

Coho salmon are native to the White Salmon River (WDF et al. 1993) and their historical distribution extended from the mouth up to RM 14 in the mainstem, and included Buck, Spring, Indian, and Rattlesnake creeks. The distribution has been limited to the area below Condit Dam (RM 3.4) since it was constructed in 1913.

There may be some coho production occurring in the lower one mile of stream below Condit Dam; however, population monitoring does not occur. Based on EDT modeling, the current abundance at equilibrium is expected to be 470 coho in the absence of harvest. EDT modeling indicates wild steelhead abundance in the absence of harvest has declined from 1,278 spawners to less than 470 spawners (Subbasin Plan 2004).

Adults enter the Columbia River from August through December with wild populations peaking in October and November. Spawning occurs from October through January, peaking in November. Adult coho are 3-year-olds and jacks are age 2. Eggs remain in the gravel until emergence, which occurs from February to April, depending on water temperatures. Shortly after fry colonization, juveniles continue rearing until October. Outmigration occurs for yearlings during the following spring, peaking in May.

It is likely that the genetic diversity and fitness of wild coho salmon in this basin has been reduced due to low carrying capacity below Condit Dam, hatchery introgression from releases to meet mitigation locations specified in US vs. Oregon, and decreased spawners due to in and out-of-subbasin fisheries.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- **ESA Status:** White Salmon River coho are part of the Lower Columbia River Coho ESU, which was listed as Threatened under the ESA in 2005.
- **Population Description:** The White Salmon coho population is designated as a Contributing population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes current viability as Very Low with a viability goal of Low.
- **Recovery Goal for Abundance:** 150
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (e.g., from EDT):** Productivity: 3.7; Capacity: 692 (with no passage at Condit Dam); Productivity: 2.1; Capacity: 2,069 (with passage at Condit Dam).

2.2 Current Hatchery Programs Affecting this Population

There are no coho hatchery programs in this watershed.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 88 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.9 to 2.9. Average abundance of natural-origin spawners (NOS) would increase from 107 to 377. Harvest contribution of the natural and hatchery populations would go from 40 to 142.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

After removal of Condit Dam and reestablishment of a natural coho run, it may be possible to manage the population consistent with the standards for a Primary population. If managed for conservation, this population could make a significant contribution to recovery of the Lower Columbia coho ESU.

Recommendations

Once a natural population is established, the HSRG recommends that managers monitor for the presence of out-of-basin strays.

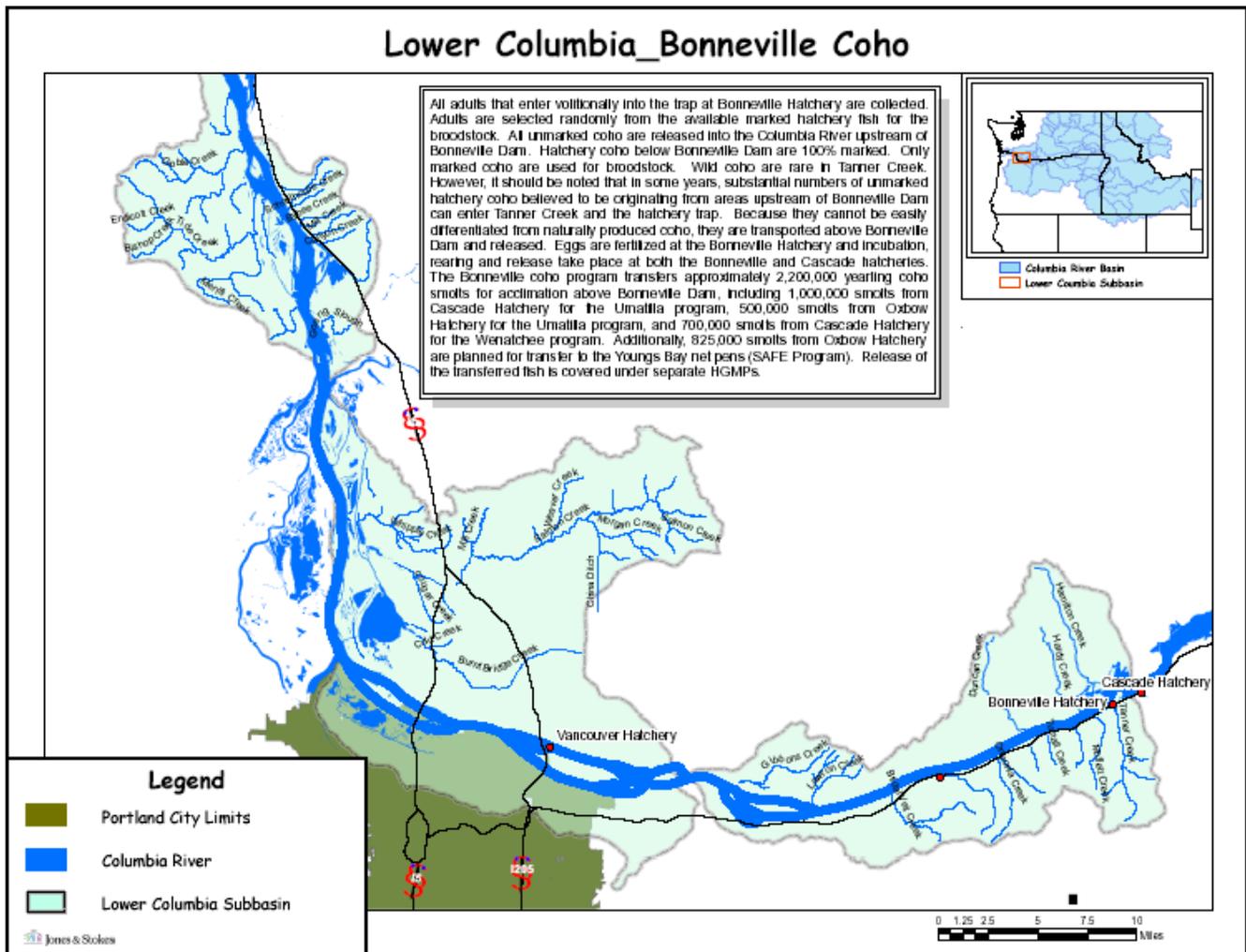
Table 1. Results of HSRG analysis of current condition and HSRG Solution for White Salmon River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 40% | 0.00 | 107 | 0.9 | 40 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 377 | 2.9 | 142 | - |
| HSRG Solution | None None | - | 0% | 0% | 6% | 0.00 | 217 | 1.8 | 82 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 4% | 0.00 | 307 | 2.3 | 116 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Bonneville Hatchery Coho Population and Hatchery Programs

January 31, 2009



1 Bonneville Hatchery Coho

2 Current Conditions

2.1 Current Population Status and Goals

The lower Columbia Bonneville coho population is a hatchery population that is included as part of the Lower Columbia River Coho ESU and is listed as threatened under the ESA. This population has no viability or recovery goals. It is maintained from returns of hatchery origin adults to the Bonneville Hatchery.

- **ESA Status:** This population is listed as threatened and is part of the Lower Columbia River coho ESU.
- **Population Description:** This is a hatchery population maintained through hatchery returns. There is no natural population associated with the Bonneville Hatchery program.
- **Current Viability Rating:** NA
- **Recovery Goal for Abundance:** NA
- **Productivity Improvement Expectation:** NA
- **Habitat Productivity and Capacity:** NA; this is a segregated hatchery population.
- **Populations Affected by this Hatchery Population Include:** These fish are likely to contribute to minor spawning aggregations in the lower Columbia River Gorge, particularly in the vicinity of the hatchery. No information was provided to indicate the scale of this straying.

2.2 Current Hatchery Programs Affecting this Population

The program attempts to meet harvest goals through the release of 1.25 million yearlings on-station at the Bonneville Hatchery. All on-station releases are identifiable by adipose fin clip and/or coded-wire tag. Each of the two release groups is represented by a 25,000 fish coded-wire tagged group. The program is described as a segregated harvest program and the broodstock is maintained from marked hatchery fish returning to the facility.

This hatchery program dates back to 1938. Historically, broodstock were collected at Eagle Creek, Herman Creek and Tanner Creek. In addition to local coho, fish were transferred into this broodstock from several other locations in the Columbia River, including Big Creek and Sandy hatcheries. This stock is a mixed, domesticated stock. It is assumed to have genetic and biological differences from the ancestral stocks in the area.

A portion of the production (approximately 500,000 fish) is maintained full-term at Bonneville Hatchery. Approximately 750,000 fish are incubated and reared at Oxbow Hatchery prior to return to Bonneville for release. Broodstock from this program also supports the select area fishery, Umatilla River, and Wenatchee River coho programs. Mating protocols use single family pairing but a few jacks are used for spawning (approximately 0.5%). Total survival from the program averaged 1.77% from brood years 1990 through 1999. On average, the program contributes approximately 8,500 fish annually to harvest.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of

effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Since this is a segregated hatchery population, the No Hatchery scenario would have no impact on the adjusted productivity or natural-origin spawners. Harvest contribution of the hatchery population would go from approximately 8,475 fish to zero under the No Hatchery scenario.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The current program releases approximately 1,250,000 smolts to meet harvest goals. Insufficient information about the scale and distribution of straying from this hatchery population was available during the HSRG’s review. There is a great deal of uncertainty as to whether program fish are adequately segregated from naturally spawning aggregates or whether there are any important natural spawning aggregates in nearby streams within the ESU or upstream of Bonneville Dam.

Recommendations

The HSRG recommends continuing the program as operated with 100% adipose fin clipping, increased coded-wire tagging, and increased monitoring of natural populations to determine the actual contribution of hatchery strays to important spawning aggregations. The proportion of jacks used in the spawning protocol should be increased.

This program is a candidate to provide broodstock for net pen programs in the Columbia Estuary. The on-station release could be reduced to approximately 750,000 fish with transfer of the remaining production (approximately 500,000 fish) to a select area fishery release site.

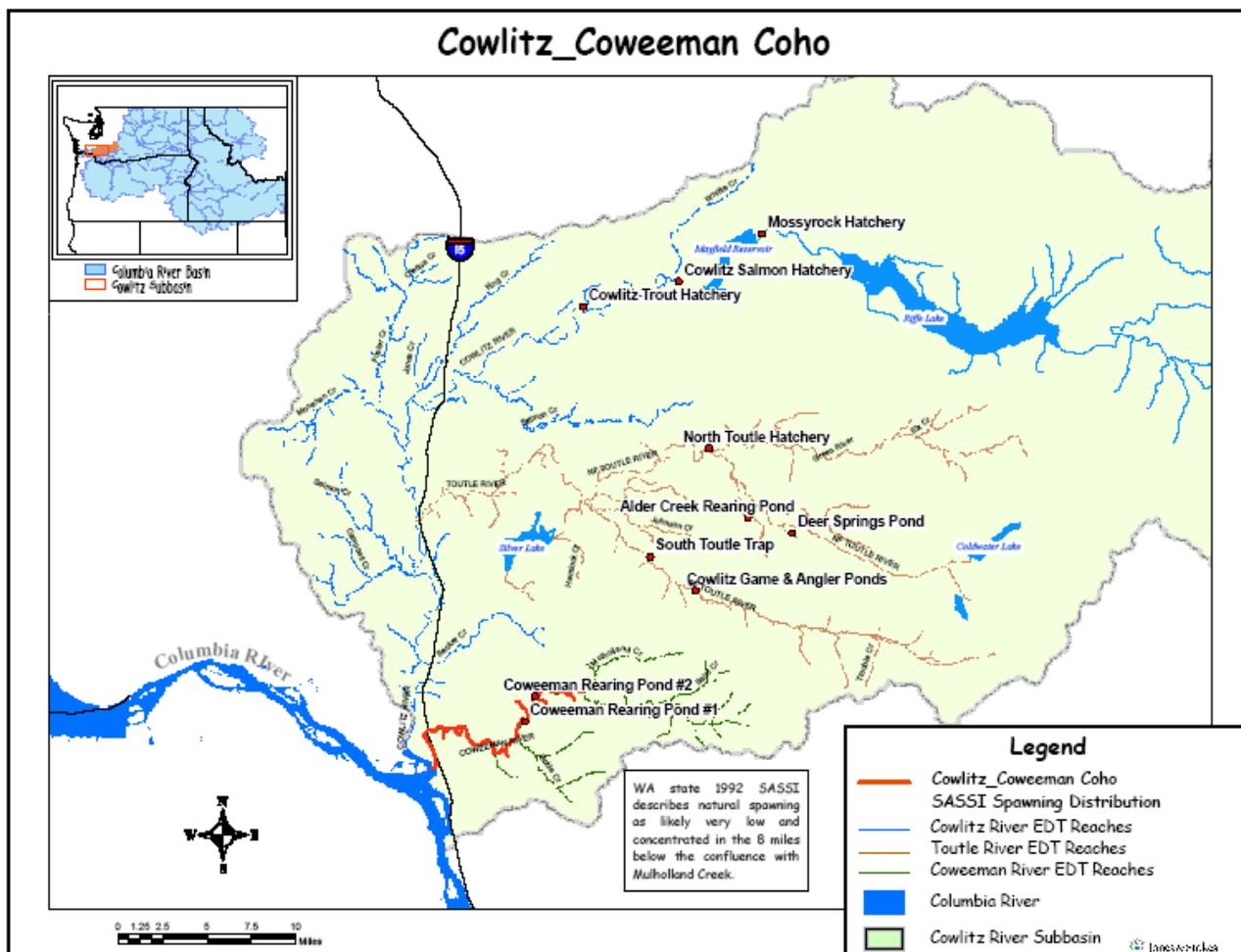
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Bonneville Hatchery Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives. objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 1,247.7 | 90% | | | | | | 8,475 | 8,545 |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 750.5 | 95% | | | | | | 6,935 | 2,005 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 750.5 | 95% | | | | | | 6,935 | 2,005 |

Hatchery Scientific Review Group Review and Recommendations

Coweeman River Coho Population and Related Hatchery Programs

January 31, 2009



1 Coweeman River Coho

Natural spawning in the Coweeman River subbasin is primarily in tributaries downstream of the confluence of Mulholland Creek. Most coho spawning in the Coweeman takes place in the mainstem Coweeman River and in tributaries such as Goble, Baird and Mulholland creeks. Spawning generally occurs from late October through February. Peak spawning occurs in December to early January.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: This population is listed as threatened and is part of the Lower Columbia River Coho ESU.
- Population Description: Coweeman coho are a primary population.
- Recovery Goal for Abundance: Unknown
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity (e.g., from EDT): Productivity: 3.37; Capacity: 2,665
- Populations Affected by this Hatchery Program Include: Cowlitz Type N coho and Toutle Type S coho.

2.2 Current Hatchery Programs Affecting this Population

Cowlitz Game and Anglers use remote site incubators (RSI) to seed habitat areas in conjunction with some habitat restoration work in Cowlitz subbasin tributaries, such as the Coweeman River. This program is covered under a HGMP entitled "Draft Hatchery and Genetic Management Plan (HGMP), Cowlitz Game and Anglers Lower Cowlitz River Tributaries- Coho Fry Releases Program."

No smolt release hatchery programs are operating in the Coweeman River.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 48 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that

these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.3 to 2.8. Average abundance of natural origin spawners (NOS) would increase from 1,265 to 1,586. Harvest contribution of the natural and hatchery populations would go from 245 to 307.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated a Primary population that appears to be productive and abundant. There are no hatchery releases in the Coweeman River.

Recommendations

The HSRG recommends that managers monitor the contribution of hatchery strays in spawning escapement. In addition, the RSI projects should be reviewed and managed consistent with the Primary population designation. Returns from RSI projects should be included when considering the pHOS for the population.

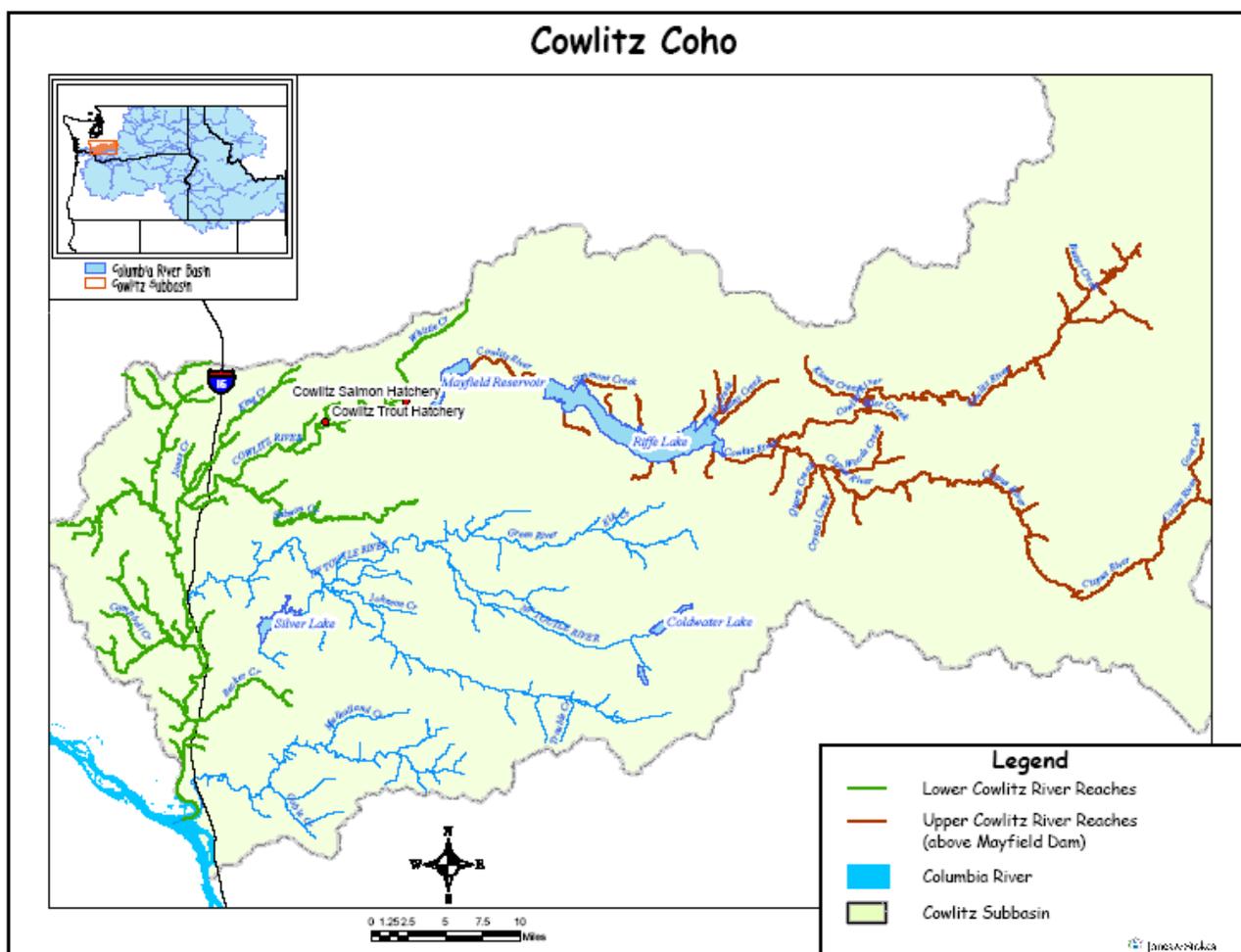
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Coweeman River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|--------------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 3% | 0.00 | 1,265 | 2.3 | 245 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 0.00 | 1,586 | 2.8 | 307 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 1,524 | 2.7 | 298 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 1,783 | 3.0 | 348 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Cowlitz River Coho Population and Related Hatchery Programs

January 31, 2009



1 Cowlitz River Coho

Naturally spawning Cowlitz coho are a composite stock influenced by hatchery releases that began in 1915. The stock typifies a Type N population, with late returns beginning in September and spawning beginning in October and generally lasting through January. The WDFW SaSSi designated this population as depressed in both their 1992 and 2002 reports due to chronically low returns (<3 fish/mile); however, greatly increased returns of ~40 fish/mile were reported in 2001 (WDFW 2002).

Cowlitz coho were identified as a stock based on their distinct spawning distribution, run timing and genetic composition. They are a Type N stock characterized by late run timing and a northern migration route in the ocean after leaving the Columbia River. Late coho (Type N) are informally considered synonymous with Cowlitz River stock coho. Columbia River late stock hatchery programs were developed from the Cowlitz River stock, their derivatives or native runs. All naturally produced, unmarked fish collected at the Cowlitz Salmon Hatchery trap are passed upstream of Mayfield Dam along with surplus hatchery fish to spawn naturally. Most spawning below Mayfield Dam takes place in the mainstem Cowlitz, with an average of 5,321 naturally produced fish being passed above the dam yearly from 2000-2004.

2 Current Conditions

2.1 Current Population Status and Goals

Both the 1992 SaSSi and 2002 SaSSi list the population as Depressed.

- ESA Status: This population is listed as Threatened.
- Population Description: The lower Cowlitz coho population is designated a primary and the upper as a contributing by the NOAA technical memo: "Historical population structure of Pacific salmonids in the Willamette River and lower Columbia River Basins".
- Current Viability Rating: Low.
- Recovery Goal for Abundance: A viability goal of 600 adults was identified in the LCSRSP, with an interim goal of 600 adults and a potential of 19,100 adults.
- Productivity Improvement Expectation: No coho productivity improvement expectation is provided by the LCSRSB. A 10% improvement in habitat is given for steelhead after implementation of the Recovery Plan. Until better data is given, it is assumed that coho would experience the same 10% increase in habitat after implementation of the Plan.
- Habitat Productivity and Capacity (from EDT): Lower Cowlitz -- Productivity 3.6; Capacity 5,297; Upper Cowlitz -- Productivity 2.4; Capacity 12,000 with a 40% FGE at Cowlitz Falls Dam.
- Hatchery Populations that Affect this Natural Population: Cowlitz River Type N coho

2.2 Current Hatchery Programs Affecting these Populations

The only hatchery population of the same species that affects this population (e.g., through straying) is Cowlitz River Type N coho. This program is described as a proposed integrated harvest program in its HGMP, but currently only marked hatchery-origin fish are collected for

broodstock. All migrating fish are denied passage by a weir at the Cowlitz Salmon Hatchery. From 2,000 to 7,000 broodstock are collected from marked hatchery origin fish entering the trap at the weir. All natural fish entering the trap are passed above the weir to spawn naturally in the upper river. Marked, hatchery-origin fish entering the trap that are in excess of broodstock needs are also passed above the weir to spawn naturally. All fish for this program are reared on-station at the Cowlitz Salmon Hatchery. Hatchery reared fish are released at the following proposed maximum numbers as outlined by the Cowlitz River Type N Coho HGMP: Fingerling- 1,000; Yearling- 3,200,000; and Unfed Fry- 257,000.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 4,725 fish Lower River and 4,394 fish Upper Cowlitz.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.5 to 3.0 and 1.0 to 1.9 in the lower and upper river, respectively. Average abundance of natural-origin spawners (NOS) would increase from 2,582 to 3,269 and 4,032 to 4,733 in the lower and upper river, respectively.. Harvest contribution of the natural and hatchery

populations would go from 38,559 to 632 and 3,228 to 815 in the lower and upper river, respectively..

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1 and Table 2. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Lower Cowlitz coho are currently designated as a Primary population. Upper Cowlitz coho are currently designated as a Contributing population. The upper Cowlitz habitat offers greater potential to contribute to natural production as a Primary population than the lower river.

Currently the program in the lower river is managed as a segregated program; however, with an observed pHOS greater than 50%, it does not meet the standards for a Primary or Contributing population. We noted that there are numerous remote site incubator (RSI) projects that are poorly evaluated and potentially contribute to the pHOS at an unknown level.

The HSRG notes that it is a challenge to access broodstock needed for an integrated program in the lower river as well as to monitor and control composition on the spawning grounds. A proposal (NPCC Innovative Proposal solicitation) has been submitted by the WDFW to develop and test non-lethal methods for live capture of adults for removal of hatchery fish and to collect broodstock to support an integrated program.

Recommendations

Managers should consider designating the upper watershed as a Primary population and the lower watershed component as a Contributing population.

In the lower river, an integrated program of 925,000 fish release and a related segregated program (stepping stone) with an 925,000 fish release could be operated consistent with a Contributing population designation. In order for this program to achieve broodstock requirements, methods for capturing broodstock and monitoring spawning composition are essential. Therefore, we strongly recommend that projects such as the one mentioned above for live capture of adults be funded and implemented. Methods developed by such an investigation will have applicability to other programs in the region.

In order for programs in the lower river to be operated consistent with a Primary designation, an integrated program of 850,000 fish release and a related segregated program (stepping stone) with an 840,000 fish release could be operated consistent with a Primary population designation.

Spawning ground surveys in lower river tributaries should be expanded to better estimate spawner abundance, distribution, and composition.

In addition, the RSI projects should be reviewed and managed consistent with the appropriate population designation. Returns from RSI projects should be included when considering the PHOS for the population.

Specific Observations/Recommendations for Upper Cowlitz Coho

Observations

The upper Cowlitz coho population is designated as Contributing, but has the potential to meet the criteria for a Primary population within the Lower Columbia River ESU. Since there are so few large Primary coho populations in this ESU, the biological value in establishing such a population in the upper Cowlitz is high.

Goals for this population are conservation and harvest.

The HSRG analysis of the upper Cowlitz coho population makes the following assumptions:

1. Average fish collection efficiency at Cowlitz Falls Dam (FCE) is in the range of 0.35 to 0.45. For our initial analysis we assumed a FCE of 0.40. We also considered possible future alternatives using increasing FCE values of 0.60 and 0.80.
2. Average SAR (Barrier Dam to Barrier Dam) is in the range of 0.035 to 0.06. For our analysis we assumed an average SAR of 0.04.
3. We also assumed that the Upper Cowlitz and Cispus components would be managed as one stock.

Recommendations

Based on a presumed primary population designation, the HSRG recommends that an integrated hatchery program be established in the upper Cowlitz River. Harvest in the upper river should be abundance-based to achieve conservation objectives. The sport fishery would be managed based on annual in-season estimates of abundance of NORs. Using the combined Upper Cowlitz and Cispus populations, a program of approximately 500,000 smolts (~420 NOR adult broodstock) could be maintained with a target PNI > 0.67.

This population would be separate from the segregated harvest program that currently exists in the lower river. Two separate populations would be maintained at the hatchery, with smolts from each program released on-station and uniquely identified. For example:

- a) A segregated harvest program (100% adipose fin-clipped only) released on-station to support downstream fisheries.
- b) An integrated harvest and conservation program (100% adipose fin-clipped and coded-wire tagged) also released on-station to support upper Cowlitz conservation and harvest goals.
- c) Broodstock for the integrated program would consist of 100% unmarked NORs and managed to achieve a PNI greater than or equal to 0.67.
- d) Tilton NORs (not used in the program) would be identified with 100% CWT and no adipose fin-clip.

Implementation of Upper Cowlitz Integrated Program

- a) Establish a minimum escapement goal of 4,000 fish (NORs + HORs). This minimum escapement level approximates the equilibrium escapement for the upper watershed (upper Cowlitz/Cispus) under current habitat conditions.
- b) Retain 420 NORs for broodstock. All unmarked NORs not needed for broodstock would be transported upstream for natural spawning.
- c) HORs would be transported upstream in a 1:1 ratio with NORs; however, when the total number of NORs passed upstream is less than 2,000 fish, the number of HORs passed upstream would be increased to achieve a total escapement of 4,000 fish for natural spawning. At this level, no harvest would be available. During the initial 3 years of this program (i.e. until returns from the new integrated program are available), hatchery returns from the current segregated program would be used to achieve the desired upstream escapement (equal to or greater than 4,000 fish). After that (beginning in Year 4), only the returning adults from the integrated program would make up the hatchery component that is passed upstream.
- d) Under this scenario, HORs passed upstream in excess of the 4,000 total escapement level would potentially be available for selective harvest on a within season management basis. For example, if 3,000 NORs plus 3,000 HORs were passed upstream, then 2,000 HORs potentially would be available for harvest.
- e) As FCE increases, greater harvest opportunities could be accommodated, while at the same time maintaining the target $PNI > 0.67$. There is also a range of options for managing the hatchery program, including integration of a larger portion of the overall Cowlitz program to the benefit of conservation and harvest.
- f) Scale samples should be taken from returning NORs to determine the incidence of hatchery-origin fish among unmarked fish. The purpose is to assess the number of adipose present hatchery fish from the segregated program that enter the upper watershed.
- g) The options considered for passing additional adults (selective passage of either male or females) is not consistent with the conservation goals for the upper watershed population at this time.
- h) Consider using surplus adult carcasses from the segregated programs for nutrient enrichment in the upper watershed.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Upper Cowlitz River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Harv | 238.8 | 0% | 0% | 47% | 0.00 | 4,032 | 1.0 | 3,365 | 1 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 4,733 | 1.9 | 830 | - |
| HSRG Solution | Int Both | 501.3 | 65% | 0% | 31% | 0.76 | 4,660 | 1.6 | 8,224 | 4,864 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Both | 501.3 | 65% | 0% | 27% | 0.79 | 5,613 | 1.8 | 8,393 | 4,864 |
| | | | | | | | | | | |

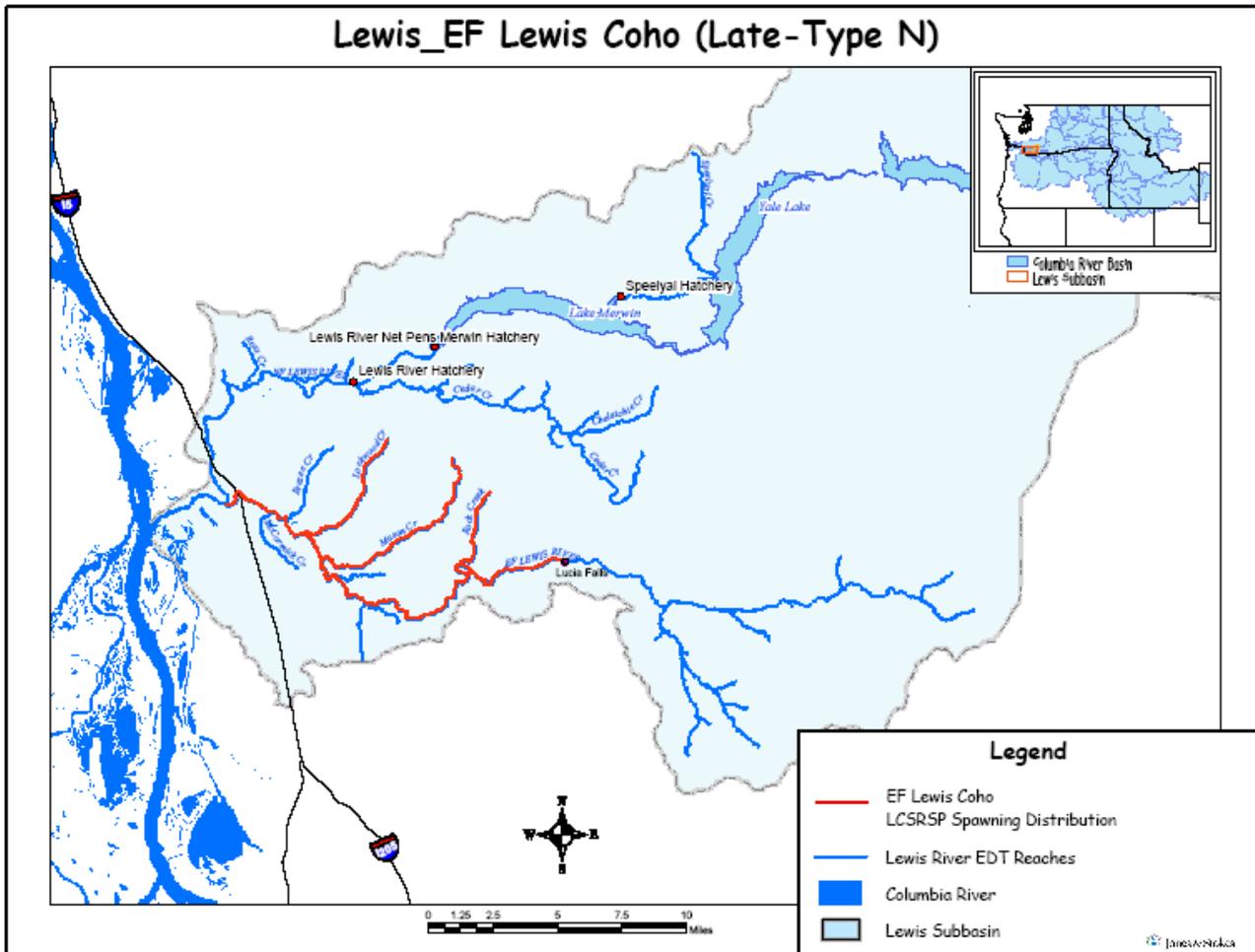
Table 2. Results of HSRG analysis of current condition and HSRG Solution for Lower Cowlitz River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 59% | 0.00 | 2,582 | 1.5 | 500 | 0 |
| | Seg Harv | 3,223.4 | 90% | | | | | | 38,115 | 40,536 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 3,269 | 3.0 | 632 | - |
| HSRG Solution | Int Harv | 850.0 | 95% | 0% | 25% | 0.69 | 2,495 | 2.5 | 13,011 | 8,737 |
| | Stepping Stone Seg Harv | 840.5 | 95% | | | | | | 12,307 | 9,652 |
| HSRG Solution w/ Improved Habitat | Int Harv | 850.0 | 95% | 0% | 21% | 0.72 | 3,022 | 2.8 | 13,114 | 8,737 |
| | Stepping Stone Seg Harv | 840.5 | 95% | | | | | | 12,307 | 9,652 |

Hatchery Scientific Review Group Review and Recommendations

East Fork Lewis River Coho Population and Related Hatchery Programs

January 31, 2009



1 East Fork Lewis River Coho

The historical East Fork Lewis adult population is estimated to have been between 5,000 and 40,000 coho. The majority of returns are late stock that spawn from late November to March. Some early stock coho were also historically present, with spawning occurring primarily in early to mid-November. Current returns are unknown but assumed to be low. Natural spawning occurs downstream of Lucia Falls (RM 21), particularly in Lockwood, Mason, and Rock creeks. Juveniles rear for a full year in the Lewis River subbasin before migrating as yearlings in the spring. Natural production is presumed to be generally low in most tributaries. Currently, no hatchery coho are released into the East Fork Lewis River (LCSR&SP 2004).

2 Current Conditions

2.1 Current Population Status and Goals

East Fork Lewis River coho are part of the Lower Columbia Coho ESU and are listed as threatened under the ESA.

- ESA Status: Threatened
- Population Description: The East Fork Lewis River Late-Type N coho population is one of 13 in the ESU and is designated as a Primary population (LCSR&SP 2004).
- Current Viability Rating: Low
- Recovery Goal for Abundance: 600
- Productivity Improvement Expectation: The recovery plan (LCSR&SP 2004) does not provide a productivity improvement expectation for coho, although for steelhead a value of 10% is given. Until better information becomes available, we assume a 10% improvement in habitat can be expected from implementation of the recovery plan.
- Habitat Productivity and Capacity (from EDT): Productivity 5.28; Capacity 2,956
- Populations Affected by this Hatchery Population Include: Co-occurring natural salmon and steelhead populations in the local tributary areas and the Columbia River mainstem. Of primary concern are the ESA listed salmonids.
- Hatchery Populations of the Same Species that may Affect this Natural Population: North Fork Lewis River Type N-Late coho program and North Fork Lewis River Type S –Early coho. The specific effects, if any, are unknown. Coho have been planted in the Lewis River subbasin since 1930; extensive hatchery coho releases have occurred since 1967.

2.2 Current Hatchery Programs Affecting this Population

There are no coho hatchery programs operating in the East Fork Lewis River. Modeling suggests that strays from the North Fork Lewis programs are exceeding primary population standards in the East Fork Lewis.

- Estimated Productivity (with harvest and fitness factor effects from AHA): 3.3
- Projected Average Natural Origin Escapement: 1,717 fish
- Average Harvest Contribution: 332 fish

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 74 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 3.3 to 4.4. Average abundance of natural-origin spawners (NOS) would increase from 1,718 to 2,142. Harvest contribution of the natural and hatchery populations would go from 332 to 414.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

East Fork Lewis River coho currently meets the standards for a Primary population designation. This is a natural population with no hatchery production.

Recommendations

We have no specific recommendations for this population.

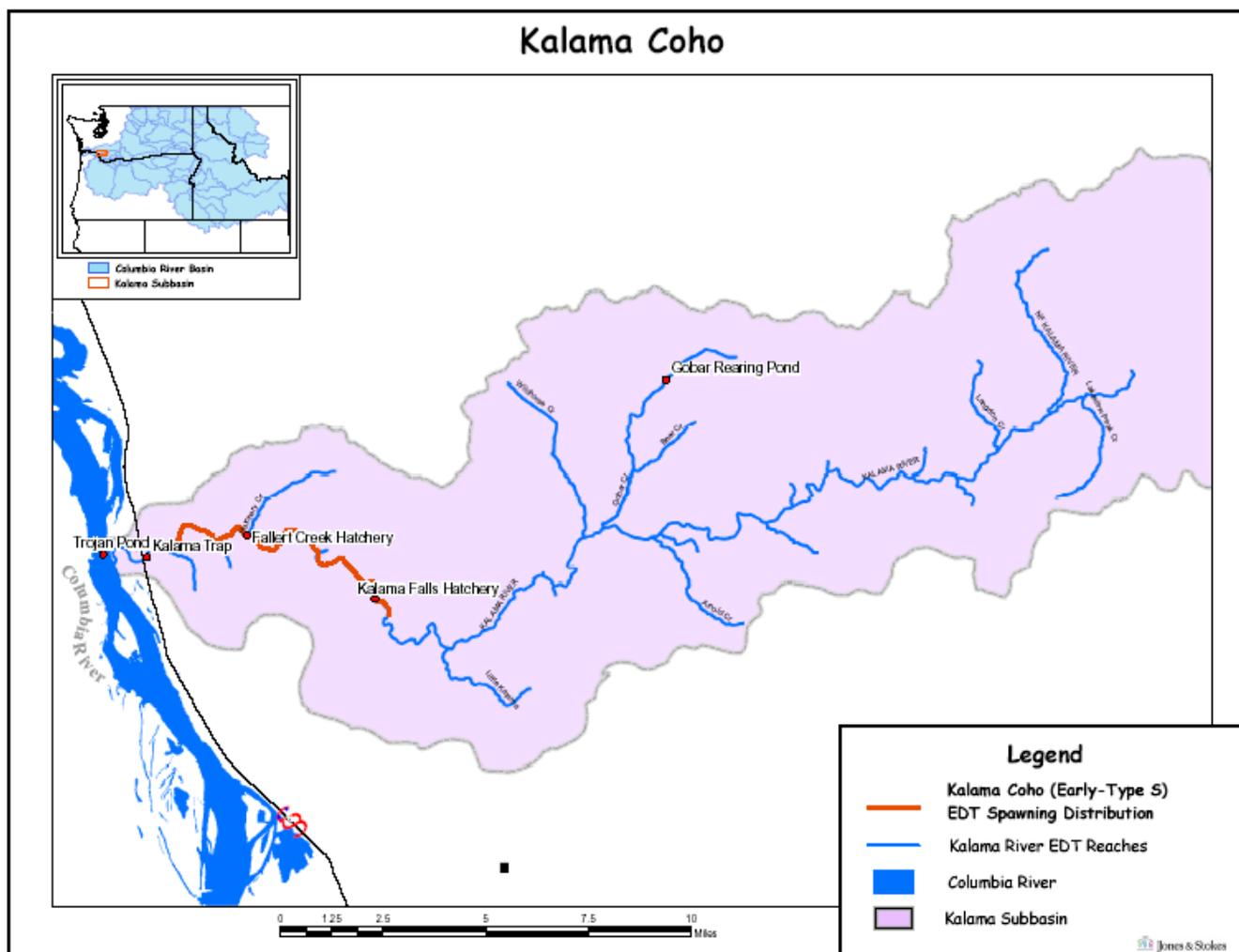
Table 1. Results of HSRG analysis of current condition and HSRG Solution for East Fork Lewis River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives. objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 83% | 0% | 3% | 0.00 | 1,718 | 3.3 | 332 | 0 |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 2,142 | 4.4 | 414 | - |
| HSRG Solution | None | - | 90% | 0% | 0% | 1.00 | 2,116 | 4.3 | 413 | 0 |
| | None | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None | - | 90% | 0% | 0% | 1.00 | 2,395 | 4.8 | 468 | 0 |
| | None | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Kalama River Coho Population and Related Hatchery Programs

January 31, 2009



1 Kalama River Coho

The Kalama coho population is part of the threatened Lower Columbia coho ESU. It is designated as a Contributing population. There are two coho hatchery programs in the Kalama. One is based largely on broodstock originating from the Kalama and the other is based on broodstock of Toutle River origin (Type S).

Adult coho enter the Kalama from September through February. Peak spawning for the early (Type S) run is in October and for the late run is in December.

2 Current Conditions

2.1 Current Population Status and Goals

The natural coho population in the Kalama is a fraction of its historic abundance. Both early and late running coho population components were present.

- ESA Status: Kalama coho are listed as threatened and are part of the Lower Columbia Coho ESU.
- Population Description: Kalama coho is a Contributing population.
- Current Viability Rating: Low, with a goal of High
- Recovery Goal for Abundance: 600 adults. Recent escapement estimates were not available, but are significantly below this goal.
- Productivity Improvement Expectation: Habitat improvements in streams used by Kalama coho are expected to increase productivity by as much as 50% (LCRSRP; personal communication, D. Rawding, WDFW).
- Habitat Productivity and Capacity (from EDT): Productivity 3.8; Capacity 660
- Populations Affected by this Hatchery Programs Include: Kalama fall Chinook and steelhead (winter and summer)

2.2 Current Hatchery Programs Affecting this Population

Kalama currently has Type S (350,000 smolt release) and Type N (350,000 smolt release) coho programs and while the intent is to run the Type N coho as an integrated program, both programs currently are run as segregated programs.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 601 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of

effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.6 to 3.2. Average abundance of natural-origin spawners (NOS) would increase from 323 to 418. Harvest contribution of the natural and hatchery populations would go from 3,904 to 81.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated a Contributing population. Kalama currently has Type S and Type N coho programs and while the intent is to run the Type N coho program as an integrated program, it is currently operated as a segregated program.

In order to be consistent with its Contributing designation, it would be necessary to eliminate the two segregated programs (Type S and Type N) and develop a small integrated conservation

program (170,000 smolt release) based on the natural population in the watershed. A Contributing population designation appears inconsistent with the limited habitat potential.

Recommendations

Designating the population as Stabilizing would be consistent with the available habitat and current operation of a segregated Type S program releasing 350,000 fish and a segregated Type N program releasing 350,000 fish.

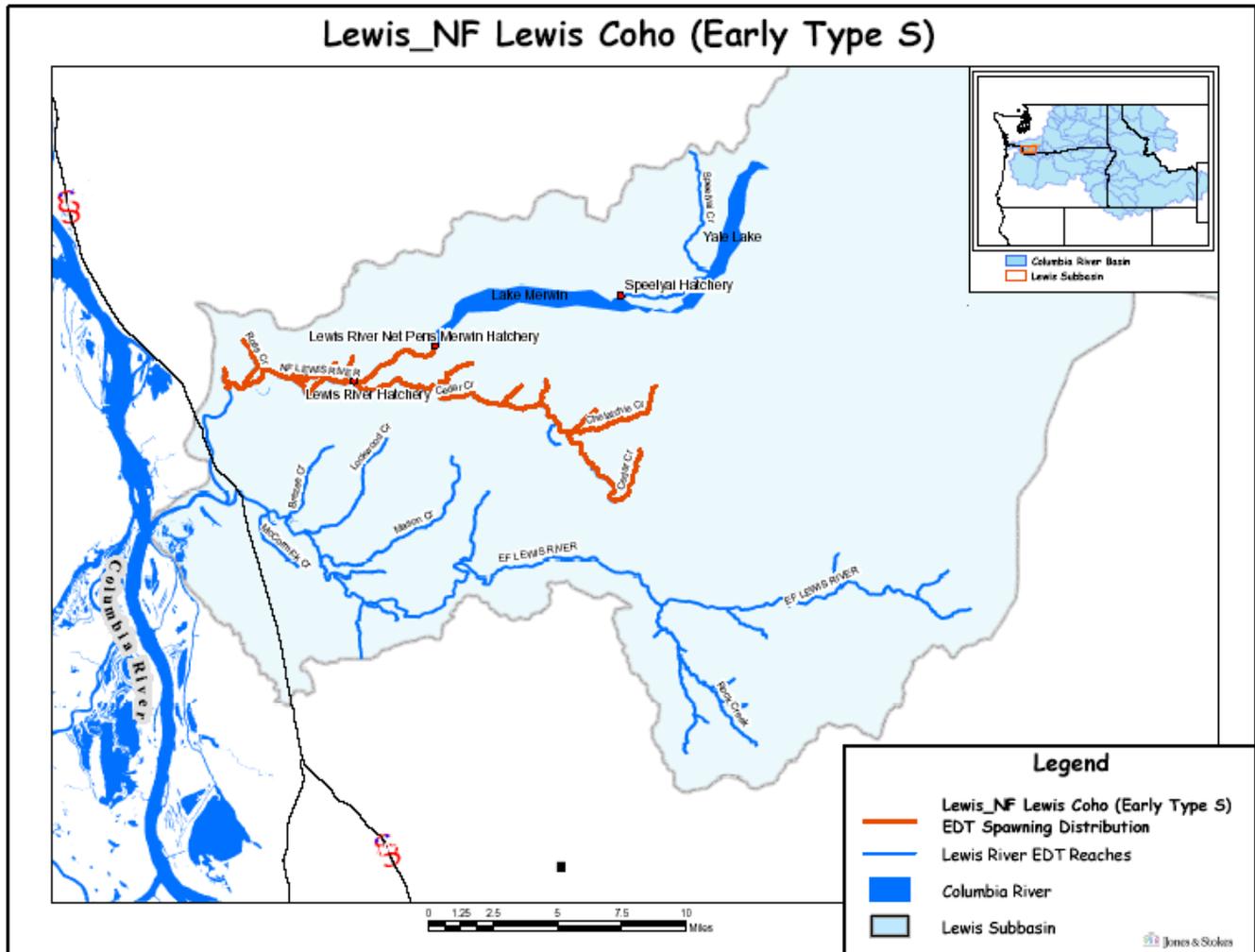
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Kalama River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 90% | 0% | 60% | 0.00 | 323 | 1.6 | 62 | 0 |
| | Type N Seg Harv | 350.8 | 90% | | | | | | 1,915 | 1,869 |
| | Type S Seg Harv | 353.1 | 90% | | | | | | 1,927 | 1,882 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 418 | 3.2 | 81 | - |
| HSRG Solution | Int None | - | 90% | 0% | 46% | 0.00 | 286 | 1.6 | 56 | - |
| | Type N Seg Harv | 350.8 | 90% | | | | | | 2,371 | 1,459 |
| | Type S Seg Harv | 353.1 | 90% | | | | | | 3,313 | 634 |
| HSRG Solution w/ Improved Habitat | Int None | - | 90% | 0% | 43% | 0.00 | 321 | 1.7 | 63 | - |
| | Type N Seg Harv | 350.8 | 90% | | | | | | 2,371 | 1,459 |
| | Type S Seg Harv | 353.1 | 90% | | | | | | 3,313 | 634 |

Hatchery Scientific Review Group Review and Recommendations

North Fork Lewis River Coho Population and Related Hatchery Programs

January 31, 2009



1 North Fork Lewis River Coho

The historical North Fork Lewis River adult population is estimated to be from 7,500 to 85,000 fish. Both early and late stocks were present historically, with the early stock spawning primarily in the upper Lewis River. Current returns are unknown, but assumed to be low and limited to the habitat downstream of Merwin Dam. Early coho are expected to be reintroduced to the habitat upstream of the hydropower facilities in the near future. Natural spawning currently occurs in tributaries below Merwin Dam including Ross, Johnson, Colvin, North Fork and South Fork Chelatchie, and Cedar creeks. A number of hatchery-produced fish spawn naturally. Early stock coho spawn from late October into late November. Juvenile rearing occurs upstream and downstream of spawning areas. Juveniles rear for a full year in the Lewis River subbasin before migrating as yearlings in the spring (LCSR&SP 2004).

2 Current Conditions

2.1 Current Population Status and Goals

North Fork Lewis River coho are part of the Lower Columbia Coho ESU and are listed as threatened under ESA.

- ESA Status: Threatened
- Population Description: The North Fork Lewis River coho population is one of 13 in the ESU and is designated as a contributing population (LCSR&SP 2004).
- Current Viability Rating: Low, with a goal of Medium
- Recovery Goal for Abundance: 600 natural spawners
- Productivity Improvement Expectation: The recovery plan (LCSR&SP 2004) does not provide a productivity improvement expectation for coho; however, for steelhead a value of 10% is given. Until better information becomes available, we assume a 10% improvement in habitat could be expected from implementation of the recovery plan.
- Habitat Productivity and Capacity (from EDT): Late Type N - Productivity 5.20; Capacity 2,900; Early Type S - Productivity 4.7; Capacity 14,500
- Populations Affected by this Hatchery Population: Co-occurring natural salmon and steelhead populations in the local tributary areas and the Columbia River mainstem. Of primary concern are the ESA-listed salmonids.
- Hatchery Populations of the Same Species that May Affect this Natural Population: Lewis River Type N-Late coho and Lewis River Type S –Early coho. The specific effects, if any, are unknown. Coho have been planted in the Lewis River subbasin since 1930. Extensive hatchery coho releases have occurred since 1967.

2.2 Current Hatchery Programs Affecting this Population

The current hatchery programs are described as a proposed integrated harvest program; however, they have been operated as segregated programs. The current condition model parameters assume segregated harvest programs.

The current hatchery program is described as a proposed integrated harvest program although only hatchery returns are used for broodstock. The Type N broodstock for the current program is of local origin. Adults are captured from volitional returns to traps at either the Lewis or Merwin hatcheries. The current annual program broodstock goal is 3,800 fish, equally divided by sex.

This level is dependent upon whether Washougal Hatchery supplies 2.75 million fish for the Klickitat River coho plants.

The North Fork Lewis Type N program includes 760 broodstock, approximately 815,000 smolts released on-station, and 460,000 eyed eggs to Fish First for RSI production in tributaries of the North Fork Lewis River.

The hatchery return surplus is 9,679 fish, substantially exceeding broodstock needs. The average harvest contribution is 12,710 fish. An additional 400,000 eyed eggs of 100% natural origin broodstock are collected and sent to Fish First for RSI production in the North Fork Lewis River.

- Projected pHOS Estimates (includes strays from all hatchery programs): 66%
- Estimated Adjusted Productivity (with harvest and fitness factor effects from AHA): 3.3
- Projected Average Natural Origin Escapement: 1,795

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: 1,235 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 2,983 fish

The Type S broodstock for the current program is of local origin. Adults are captured from volitional returns to traps at either the Lewis River Hatchery or at Merwin Dam. The program includes 760 broodstock and approximately 880,000 smolts. The hatchery return surplus is 13,795 fish, substantially exceeding broodstock needs. The average harvest contribution is 13,732 fish.

- Projected pHOS Estimates (includes strays from all hatchery programs): 0%
- Estimated Adjusted Productivity (with harvest and fitness factor effects from AHA): 3.9
- Projected Average Natural Origin Escapement: 10,043

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 31 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more

proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 3.3 to 4.4 for the Type N population and would remain at 3.9 for the Type S population. Average abundance of natural-origin spawners (NOS) would increase from 1,821 to 2,102 for the Type N population and would remain increase from 10,112 to 10,159 for the Type S population. Harvest contribution of the natural and hatchery populations would go from 12,979 to 407 for the Type N population and would go from 14,787 to 1,965 for the Type S population..

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager’s goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Both Type S and N coho are reared in the North Fork Lewis. The Type N population is a Contributing population while the Type S segregated harvest program is also a gene bank for reintroduction of coho above Merwin Dam. The majority of the habitat in the basin is in the upper river, where potentially a Primary Type S population could be established; however, currently there is no provision for juvenile passage. Once passage is established, this population may meet the standards of a Primary population. In the long term, the recent hydropower settlement agreement includes a reintroduction intent into the upper North Fork of Type S coho.

As hatchery programs are currently operated, the Type N population in the lower river does not meet the standards of a Contributing population.

Recommendations

Convert the existing segregated Type N program to an integrated program of 230,000 smolts to be consistent with standards for a Contributing designation for the North Fork Lewis Type N population.

Convert the existing Type S segregated program to a gene banking program that would produce 120,000 smolts for future reintroduction upstream of Merwin Dam. This change in the Type S program would not affect the status of the North Fork Lewis Type N population. Once the upper North Fork population is restored, the Type S hatchery program could be increased.

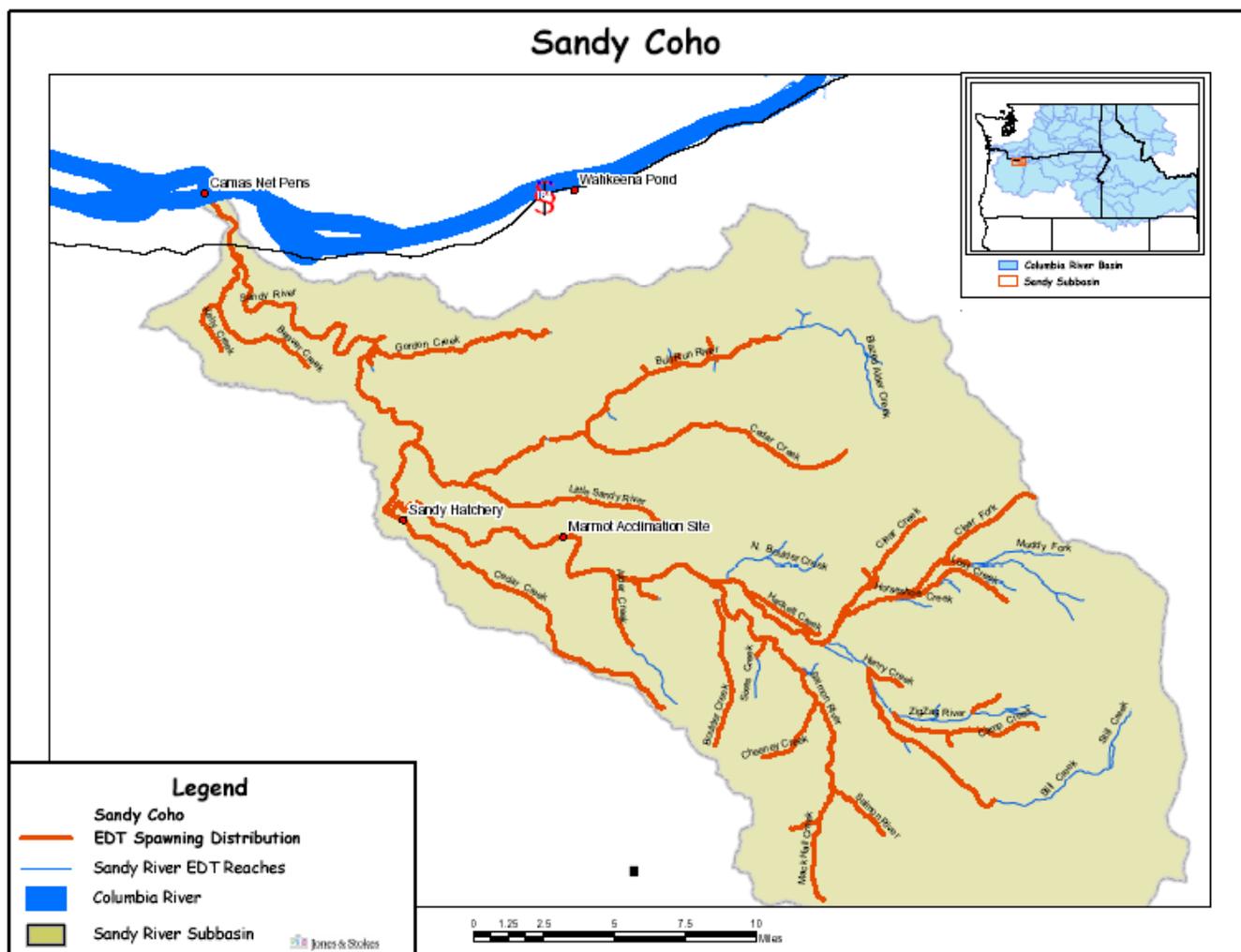
Table 1. Results of HSRG analysis of current condition and HSRG Solution for North Fork Lewis River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|--------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Type N Int Harv | 40.0 | 0% | 0% | 66% | 0.60 | 1,821 | 3.3 | 1,094 | 1 |
| | Type S None | - | 0% | 0% | 0% | 1.00 | 10,112 | 3.9 | 1,956 | 0 |
| | Type N Hatchery Seg Harv | 815.1 | 90% | | | | | | 11,885 | 9,678 |
| | Type S Hatchery Seg Harv | 880.0 | 90% | | | | | | 12,830 | 13,795 |
| No Hatchery | Type N None | - | 0% | 0% | 0% | 0.00 | 2,102 | 4.4 | 407 | - |
| | Type S None | - | 0% | 0% | 0% | 1.00 | 10,159 | 3.9 | 1,965 | - |
| HSRG Solution | Type N Int Harv | 231.6 | 90% | 0% | 19% | 0.62 | 1,792 | 3.5 | 4,015 | 3,442 |
| | Type S None | - | 0% | 0% | 0% | 1.00 | 10,136 | 3.9 | 1,981 | 0 |
| | Type N Hatchery Seg Harv | - | 90% | | | | | | - | - |
| | Type S Hatchery Seg Harv | 115.8 | 90% | | | | | | 2,090 | 1,454 |
| HSRG Solution w/ Improved Habitat | Type N Int Harv | 231.6 | 90% | 0% | 17% | 0.64 | 2,072 | 3.9 | 4,070 | 3,442 |
| | Type S None | - | 0% | 0% | 0% | 1.00 | 11,501 | 4.3 | 2,247 | 0 |
| | Type N Hatchery Seg Harv | - | 90% | | | | | | - | - |
| | Type S Hatchery Seg Harv | 115.8 | 90% | | | | | | 2,090 | 1,454 |

Hatchery Scientific Review Group Review and Recommendations

Sandy River Coho Population and Related Hatchery Programs

January 31, 2009



1 Sandy River Coho

The wild population of coho salmon in the Sandy River is part of the Lower Columbia River coho salmon Evolutionarily Significant Unit (ESU) and is listed as threatened under the federal Endangered Species Act (ESA), effective July 2005. Sandy River coho also are listed as endangered under the Oregon State Endangered Species Act. Habitat conditions below Marmot Dam are slightly to moderately impaired. Above Marmot Dam, habitat conditions are generally better than below. Blockages of Bull Run and the Little Sandy River significantly reduce the distribution of coho. Additionally, poor conditions in the lower river may reduce or restrict utilization by coho salmon (McElhany et. al. 2004).

2 Current Conditions

2.1 Current Population Status and Goals

The naturally spawning coho population in the Sandy is relatively healthy. Information provided by ODFW suggests that this primary population is meeting the highest viability standard.

- **ESA Status:** This population is listed as threatened and is part of the Lower Columbia River Coho ESU.
- **Population Description:** Sandy River coho are designated a Primary population. The segregated hatchery program in the Sandy was originally derived from the Sandy population; no other stocks have been imported. No other hatchery-origin coho have been observed returning to the Sandy River Hatchery. The contribution of hatchery fish to natural spawning is relatively small (<5%).
- **Current Viability Rating:** High
- **Productivity Improvement Expectation:** Habitat productivity and capacity estimates provided by McElhany et. al. (2007 Draft) are 6.09 and 13,665. Values derived from EDT analysis were significantly lower (4.25 and 3,180, respectively). Based on EDT assumptions, the adjusted productivity (accounting for harvest and hatchery effects) is about 4, with an average natural-origin escapement of about 8,000-9,000 fish.

2.2 Current Hatchery Programs Affecting this Population

The Sandy River coho program is managed as a segregated hatchery program. The current program utilizes only hatchery-produced Sandy River coho returning to the Sandy Hatchery and/or Marmot Dam as broodstock. The limited number of returning hatchery adults that migrate upstream of Cedar Creek were segregated from the naturally spawning wild population through sorting operations at the recently-removed Marmot Dam fish collection facilities.

Adults are collected at Sandy Hatchery where they are held, spawned, incubated and reared. Smolts are released at about 13 to 15 fish per pound directly from the hatchery into Cedar Creek in two release groups, one in April and one in May.

- The program currently releases ~ 700,000 smolts
- Analysis based on the more conservative EDT productivity estimates suggest a pHOS of about 13%.

- Harvest contributions exceed 5,000 (from both natural and hatchery production).
- Hatchery returns exceed broodstock needs.
- Modeling suggests that stray coho from Bonneville Hatchery releases are a problem; however, very few marked coho have been observed at the Marmot Dam trapping facility.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: approximately 584 fish

Population(s) directly affected by the program are:

- Lower Columbia River coho - Lower Columbia River coho salmon are present in numerous Oregon tributaries to the lower Columbia; however, coho observed in some of these subbasins are hatchery stocks and few wild fish are present. An exception to this is the small, self-sustaining populations in the Sandy and Clackamas rivers and small, self-sustaining populations of naturally-produced coho in Scappoose Creek, Clatskanie River, and above Willamette Falls. The population above Willamette Falls is of hatchery-origin.

Population(s) Indirectly Affected by the Program: All ESA-listed species occupying habitat in the lower Sandy River and/or the lower Columbia River migration corridor(s) may be affected by the presence of Sandy River (hatchery) coho salmon. While the potential exists for negative impacts, no direct effect has yet to be quantified regarding which, if any, of these populations are affected, and in what way. It is believed that any incidental impact to listed species will be minimal, based upon risk-aversion measures of the hatchery program identified in this HGMP. Listed species are identified below.

- Lower Columbia River Chinook - The Lower Columbia River Chinook salmon ESU was listed as threatened under the ESA, effective May 24, 1999. This ESU includes all naturally spawned Chinook populations residing below impassable natural barriers (e.g., long-standing, natural waterfalls) from the mouth of the Columbia River to the crest of the Cascade Range just east of the Hood River in Oregon and the White Salmon River in Washington. This ESU excludes populations above Willamette Falls, as well as Clackamas River spring Chinook. Within this ESU, there are historic runs of three different Chinook salmon populations: spring-run, tule, and late-fall “bright” Chinook salmon.
- Columbia River Bull Trout - The USFWS issued a final rule listing the Columbia River population of bull trout as a threatened species on June 10, 1998. The Hood River Recovery Unit forms part of the range of the Columbia River population and encompasses the Sandy River subbasin.
- Lower Columbia River Steelhead - The Lower Columbia River steelhead ESU was listed as threatened under the ESA on March 19, 1998. This ESU contains tributaries to the Columbia River between the Cowlitz and Wind rivers in Washington, inclusive, and the Willamette and Hood rivers in Oregon, inclusive. Excluded are steelhead in the upper Willamette River Basin above Willamette Falls, and steelhead from the Little and Big White Salmon rivers in Washington.
- Lower Columbia River Chum - The Lower Columbia River chum salmon were listed as a threatened species on March 25, 1999. The ESU includes all naturally spawning populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 3.2 to 5.1. Average abundance of natural-origin spawners (NOS) would increase from approximately 7,300 fish to approximately 10,300 fish. Harvest contribution of the natural and hatchery populations would go from approximately 5,400 fish to approximately 1,900 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Very few marked coho have been observed at the collection facility at Marmot Dam. The West Coast Salmon and Steelhead Status Review (NOAA 2005) estimated a 97 percent homing rate. The current segregated hatchery program (700,000 smolts) is operated consistent with a designation of Sandy coho as a Primary population and meets both conservation and harvest goals.

Recommendations

Continue to monitor the contribution and distribution of hatchery fish on the spawning grounds.

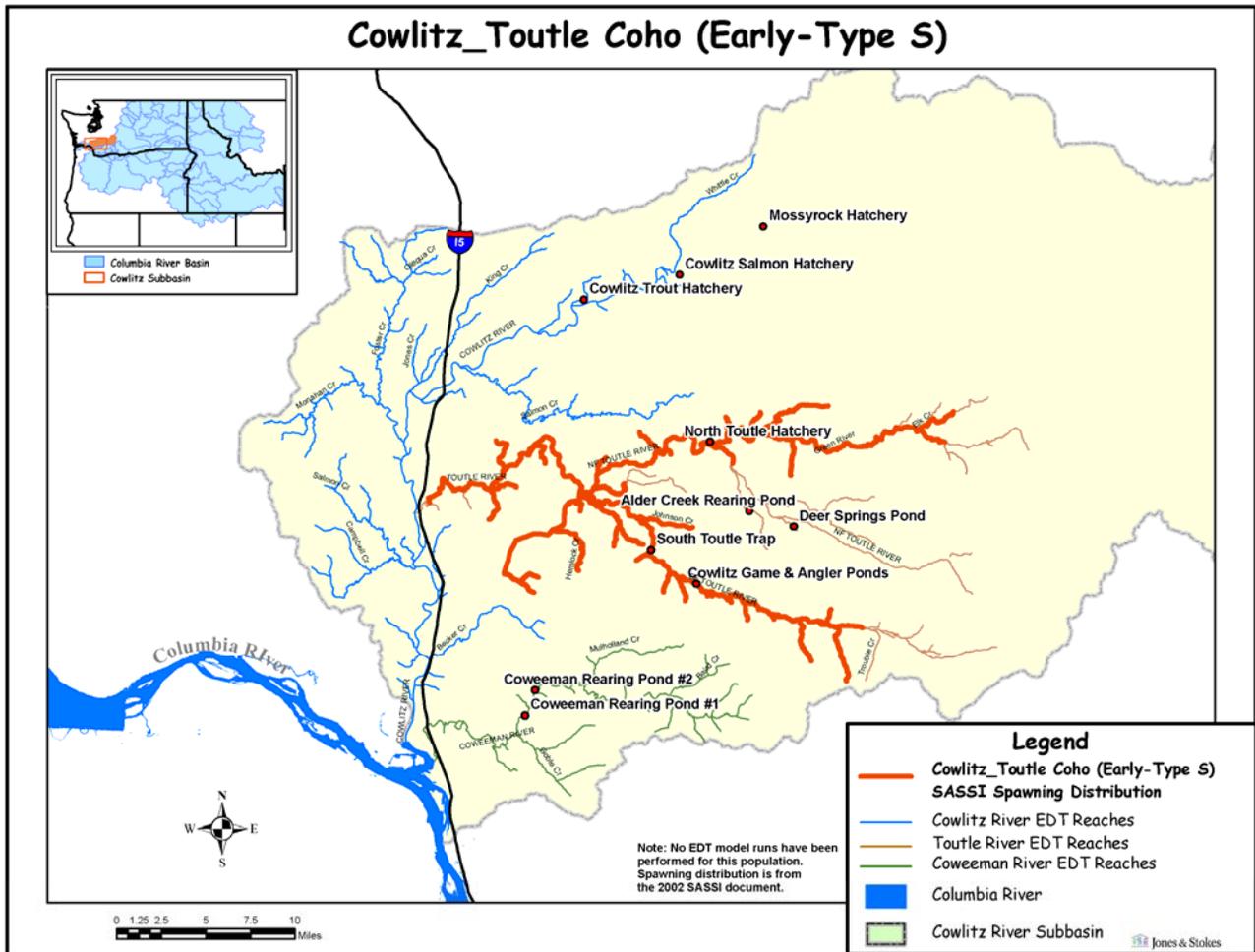
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Sandy River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 95% | 0% | 6% | 0.00 | 7,294 | 3.2 | 1,323 | 0 |
| | Seg Harv | 700.1 | 95% | | | | | | 4,099 | 5,792 |
| No Hatchery | None None | - | 0% | 0% | 0% | 0.00 | 10,321 | 5.1 | 1,872 | - |
| HSRG Solution | None None | - | 95% | 0% | 2% | 0.00 | 9,536 | 4.6 | 1,748 | 0 |
| | Seg Harv | 700.1 | 97% | | | | | | 5,381 | 4,684 |
| HSRG Solution w/ Improved Habitat | None None | - | 95% | 0% | 2% | 0.00 | 10,892 | 5.1 | 1,997 | 0 |
| | Seg Harv | 700.1 | 97% | | | | | | 5,381 | 4,684 |

Hatchery Scientific Review Group Review and Recommendations

North Fork and South Fork Toutle Coho Population and Related Hatchery Programs

January 31, 2009



1 North Fork and South Fork Toutle Coho

Toutle coho are a highly mixed stock heavily influenced by a long history of hatchery planting typical of most Lower Columbia coho populations. Historically, large returns were experienced in both the North Fork and South Fork Toutle, with average rack returns of >13,000 fish for 1972 through 1979 (~1,600 natural, ~12,000 hatchery origin). The eruption of Mount St. Helens destroyed much of the available spawning habitat in the North Fork Toutle, drastically reducing the natural spawning potential of the population. Sections of the Green River (a right bank tributary to the North Fork Toutle) and the South Fork Toutle still contain spawning and rearing habitat that were not significantly affected by the Mount St. Helens eruption. Currently, status and abundance are unclear and numbers of the naturally spawning population are unknown.

Toutle coho were identified as a stock based on their distinct spawning distribution. The South Fork Toutle segment of this population occurs in several tributaries that remained unaffected by the eruption of Mount St. Helens. Portions of the Green River also remained unaffected by the eruption. The most disturbed sections occur in the North Fork Toutle. The 1992 SaSSIs for North Fork Toutle, Green, and South Fork Toutle portions of the population all rate the population as Depressed due to chronically low production, while the 2002 SaSSIs state that status is unknown due to a lack of production data. Natural spawning is thought to occur in most areas accessible to coho, including the mainstem Toutle, and North Fork Toutle/Green Rivers and all accessible tributaries. Peak spawning occurs in late October for early stock (Type S) and December to early January for late stock (Type N).

2 Current Conditions

2.1 Current Population Status and Goals

At the time that the Lower Columbia Salmon Recovery and Subbasin Plan was written, coho were not listed under the ESA and so were not included in the Plan's recovery goals. The 1992 SaSSI (WDFW 1992) listed the population's status as Depressed and the 2002 SaSSI (WDFW 2002) listed the status as Unknown due to a lack of abundance data.

- **ESA Status:** This population is listed as threatened.
- **Population Description:** Designated as a Primary population in the LCRSRP.
- **Current Viability Rating:** Low. A goal of High viability has been identified in recovery planning documents.
- **Recovery Goal for Abundance:** A viability goal of 600 adults each was identified in the LCRSRP for both the North Fork Toutle and South Fork Toutle with an interim goal of 600 and a potential of 32,900 for the South Fork and a potential of 1,200 for the North Fork.
- **The level of current escapement is approximately 1,300 adults (300 wild, 1,000 hatchery-origin).**
- **Productivity Improvement Expectations:** No productivity improvement expectation is provided by the LCSRSP. A 10% improvement in habitat is given for steelhead after implementation of the Recovery Plan. Until better data is given, we assume that coho would experience the same 10% increase in habitat after implementation of the Plan.

- Habitat Productivity and Capacity (from EDT): Productivity 2.17; Capacity 7,349
- Hatchery Populations of the Same Species that Affect this Natural Population: North Fork Toutle Hatchery Type S Coho

2.2 Current Hatchery Programs Affecting this Population

The only hatchery population of the same species that affects this population is North Fork Toutle Hatchery Type S coho. This program is described as integrated in its HGMP (2001); however, as of 2004, only marked, hatchery-origin fish that volitionally returned to the rack at the hatchery were included in the brood. Brood collection goals are set at 700 total brood at a 1:1 male to female ratio with a 2% jack component; however, average brood collections from 1993 through 2002 were 1,749 total brood. The HGMP states that the goal is to volitionally release 800,000 yearling fish on site from the Green River Fish Hatchery located approximately 0.81 km above the confluence of the Green and North Fork Toutle. All fish are reared and released on site.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 4,579 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.9 to 1.8. Average abundance of natural-origin spawners (NOS) would increase from 2,695 to 2,969. Harvest contribution of the natural and hatchery populations would go from 15,592 to 574.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Toutle coho is designated as a Primary population for recovery. The current program is a segregated program (800,000 smolt release) which causes the natural population not to meet standards for a Primary population designation.

This is a potential source of fish to supply net pen programs in the lower Columbia River.

There is an adult fish collection facility at the Sediment Retention Dam on the North Fork Toutle River that can remove additional hatchery fish from the spawning escapement and can be a source for collecting natural-origin adults for an integrated hatchery program.

Recommendations

Manage as an integrated harvest program (560,000 release on-station) consistent with the Primary population designation. Use the adult fish collection facility at the Sediment Retention Dam to manage the spawning composition and collect natural-origin fish for the integrated program.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for North and South Fork Toutle River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 58% | 0.00 | 2,695 | 0.9 | 521 | 0 |
| | Seg Harv | 801.3 | 75% | | | | | | 15,071 | 13,532 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 2,969 | 1.8 | 574 | - |
| HSRG Solution | Int Harv | 560.3 | 95% | 20% | 14% | 0.75 | 2,266 | 1.6 | 13,532 | 10,042 |
| | Seg Harv | - | 0% | | | | | | - | - |
| HSRG Solution w/ Improved Habitat | Int Harv | 560.3 | 95% | 20% | 10% | 0.80 | 3,091 | 1.8 | 13,693 | 10,042 |
| | Seg Harv | - | 0% | | | | | | - | - |

1 Washougal River Coho

The majority of the historical Washougal coho population returns as late stock (Type N) and spawns from late November to March. Peak spawning for late stock occurs in December and January. Some early stock (Type S) coho were also historically present, spawning primarily in early to mid-November. Peak spawning for the early stock occurs in mid-October to November, although current returns of early coho are unknown but are assumed to be very low. A number of hatchery-produced fish spawn naturally. The mainstem Washougal is not a primary coho spawning area but has some production potential downstream of Salmon Falls.

Washougal River coho were identified as a stock based on their distinct spawning distribution. Most spawning takes place in the lower mainstem and in the Little Washougal, a right bank tributary approximately 6 miles upstream of the Washougal's confluence with the Columbia. Typically, coho begin entering the Washougal River in early September and continue entering the subbasin through February. Spawning occurs from mid-October through February. Natural spawning can occur in most areas of the basin upstream to Dougan Falls, but the principal spawning area is the Little Washougal River. The mainstem Washougal is not considered primary spawning habitat.

2 Current Conditions

2.1 Current Population Status and Goals

When the Lower Columbia Salmon Recovery and Subbasin Plan was written, coho were not listed under the ESA and so were not included in the Plan's recovery goals. A Washougal coho population is documented by the LCSRSP. The WDFW SaSSI 2002 also identifies a Washougal coho population, but neither document distinguishes the population as either Type S or Type N. Hatchery production in the early 1970s focused on Type S stock but in the late 1970s, shifted to Type N to increase benefits to Washington fishermen. The 1992 SaSSI rated this population as depressed, while the 2002 SaSSI rated its status as unknown due to a lack of abundance data for recent years.

- ESA Status: This population is listed as threatened.
- Population Description: Designated as a Contributing population in the LCSRSP.
- Current Viability Rating: Low. A goal of Medium viability has been identified in recovery planning documents.
- Recovery Goal for Abundance: A viability goal of 300 adults was identified in the LCSRSP; an interim goal of 600 adults was also identified with a potential of 4,200 adults.
- Productivity Improvement Expectation: No productivity improvement expectation is provided by the LCSRSP. A 10% improvement in habitat is assumed for steelhead after implementation of the Recovery Plan. It is assumed that coho would experience the same 10% increase in habitat after implementation of the Recovery Plan.
- Habitat Productivity and Capacity (from EDT): Productivity 2.39; Capacity 1,584
- Hatchery Populations that Affect this Natural Population: Washougal Coho (Late Type N)

2.2 Current Hatchery Programs Affecting this Population

The only hatchery coho population operating in the Washougal watershed is at the WDFW Washougal hatchery. The Washougal Coho (Late Type N) HGMP describes this program as an integrated program, but since mass marking began in 1998, only marked, hatchery-origin fish are collected for brood. Prior to mass marking, the program was integrated with the natural population; however, without distinguishing marks, to what extent is unclear. The HGMP explains that a higher rate of integration with the natural population was scheduled to begin in 2004. From 1987 to present (with the exception of 1993 when Lewis Type N stock was used due to a shortfall), only Washougal Type N stock volunteering at the hatchery has been used for brood. The program goal is to collect 1,020 broodstock with a 1:1 male to female ratio and a 2% jack component to meet the rear and release goal of 500,000 smolts. Up to 2,300 broodstock may be collected. From 1990 through 2001, an average of 1,832 adults was collected, resulting in an average release of 373,332 smolts. Approximately 124 of the brood collected at the Washougal Hatchery are spawned to meet a goal of 165,000 eyed eggs for remote site incubators in Salmon Creek. Additionally, 12,000 fry are distributed to approximately 48 Salmon in the Classroom programs (250 fry each), of which half are planted in Salmon Creek with the other half are planted at various locations throughout Clark County. If escapement allows, some of the brood has been used for transfers to the Klickitat River. The program currently transfers eyed eggs from the Washougal Hatchery to the Klickitat Hatchery for rearing and a release of 1,000,000 smolts. The Washougal Hatchery also rears and outplants 2,500,000 smolts to the Klickitat River.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: 858 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 591 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.0 to 2.0. Average abundance of natural-origin spawners (NOS) would increase from 668 to 734. Harvest contribution of the natural and hatchery populations would go from 6,945 to 142.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Washougal coho are designated a Contributing population for recovery. Although the intent is to manage this program as integrated, the pNOB is currently 0%. In addition, a haul-and-plant of 2.5 million unmarked coho now goes to the Klickitat River, resulting in large numbers of unmarked fish returning to the Washougal River.

Recommendations

It is recommended that the use of Washougal broodstock for the Klickitat River be eliminated. Operating an integrated hatchery program of 230,000 smolts for harvest and conservation along with an associated segregated harvest program (stepping stone of approximately 280,000 fish) would be consistent with the designation of Washougal coho as a Contributing population.

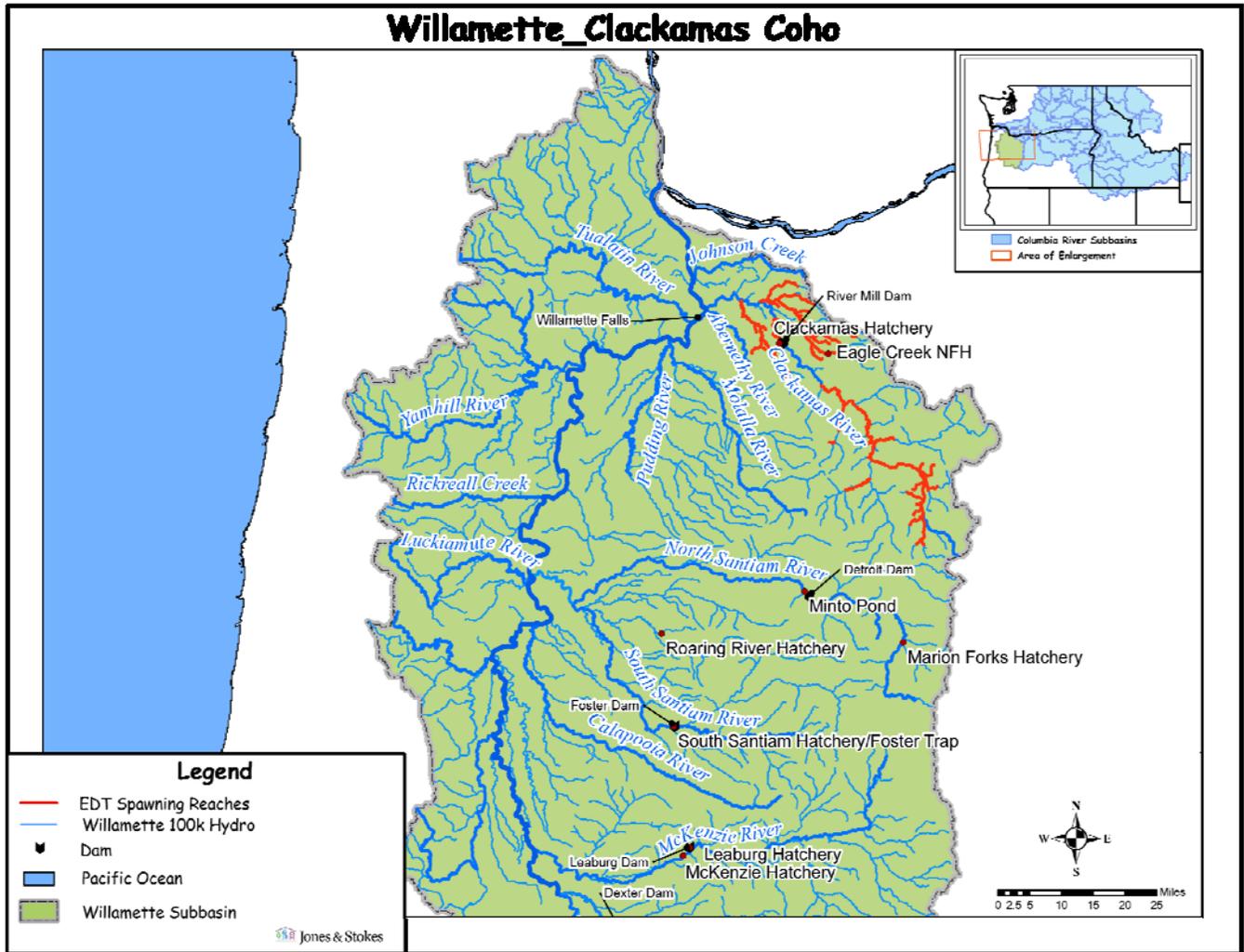
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Washougal River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|----------------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Harv | 497.9 | 90% | 0% | 63% | 0.05 | 668 | 1.0 | 6,945 | 7,312 |
| | Stepping Stone Hatchery Seg Harv | - | 0% | | | | | | - | - |
| No Hatchery | None None | - | 0% | 0% | 0% | 0.00 | 734 | 2.0 | 142 | - |
| HSRG Solution | Int Both | 231.6 | 95% | 0% | 40% | 0.56 | 537 | 1.4 | 4,049 | 2,728 |
| | Stepping Stone Hatchery Seg Harv | 280.2 | 90% | | | | | | 6,593 | 1,868 |
| HSRG Solution w/ Improved Habitat | Int Both | 231.6 | 95% | 0% | 35% | 0.59 | 675 | 1.7 | 4,076 | 2,728 |
| | Stepping Stone Hatchery Seg Harv | 280.2 | 90% | | | | | | 6,593 | 1,868 |

Hatchery Scientific Review Group Review and Recommendations

Willamette - Clackamas River Coho Salmon Population and Related Hatchery Programs

January 31, 2009



1 Clackamas Coho Salmon

Coho salmon in the Clackamas River consist of two population components, a lower river and an up river component. The up-river component is believed to be descended from the native Clackamas River population and is managed for wild production. The lower river component is heavily influenced by hatchery fish released into the lower river. This report describes both population components.

Early coho enter the Clackamas River in August and spawn in October and November (Cramer and Cramer 1994). The late run enters the Clackamas River from November to January. The outmigration of coho juveniles for the Clackamas River generally begins in April, peaks in May and June and is essentially over by early July. Historically, a second outmigration of smolts occurred in the fall, primarily during November (Cramer and Cramer 1994).

In the Clackamas River, approximately 568 km of potential coho habitat is currently available (93%) out of 613 km of historical habitat. In 2002, the escapement of coho was approximately 2,402 adults below North Fork Dam and 1,001 adults were passed above North Fork Dam. The portion of the population above North Fork Dam has a relatively low fraction of hatchery-origin spawners (12% HOR in 2002), while they dominate the area below the dam (78% HOR in 2002) (Waples et al. 2005). Since 2002, the number of coho adults passed above North Fork Dam has ranged from approximately 1,200 to 2,500, with no marked hatchery-origin fish passed above North Fork Dam (PGE 2007). Nearly 110,000 coho smolts passed the North Fork Dam in 2002.

The Clackamas River population above North Fork Dam is one of only two populations in the ESU for which natural production trends can be estimated. For coho above North Fork Dam, the long-term trends (1973 to 1998) have been slightly positive (1.080) and the short-term trends and growth rate (λ) estimates (1990-1998) have been slightly negative (0.884 and 0.902, respectively). Based on the stock assessment analysis that assumes the Clackamas River coho consist of two population components, Zhou and Chilcote (2003) concluded that the up-river component had a relatively low risk of extinction.

Overall, the Clackamas River population has experienced recruitment failure over the last decade. Abundance has been relatively low, placing the population in a range where environmental, demographic and genetic stochasticity can be significant risk factors (Waples et al. 2005). However, abundance has increased in 2005, 2006 and 2007 (personal communication, Todd Alsbury, ODFW). The harvest rate of natural-origin Clackamas River coho has been substantially reduced from 0.7-0.95 to ~0.12 in recent years by switching to a retention-only marked hatchery fish harvest and timing the fishery to protect natural runs (Waples et al. 2005).

The Clackamas natural population also includes coho salmon spawning in Willamette River tributaries below Willamette Falls, including Johnson, Abernethy, Tryon and Kellogg creeks. Coho were also documented in tributaries to Multnomah Channel from 1951 to 1959 (Willis et al. 1960). Presently, the biological community (including salmonids) within all of these tributaries has been greatly reduced from historical conditions due to degradation associated with agricultural and urban development.

Very little data is available for coho utilizing these tributaries separately from the Clackamas River population. Coho enter the tributaries in October and November depending on the timing of fall freshets. Peak spawning occurs in November.

Coho productivity, capacity and abundance have been assessed in Johnson, Tryon and Kellogg creeks using EDT. The total estimated capacity of these tributaries was 584 adults and the weighted average productivity was 1.64, with the bulk of the production in Johnson Creek. Johnson Creek coho adults migrated through and occupied lower, middle, and upper areas of the watershed; however, the best spawning habitat was believed to be in the upper watershed (Fulton, 1970). Observations of adult and juvenile coho in lower Johnson Creek and Crystal Springs suggests within population recruitment and production and/or use by other Willamette Basin populations. Coho salmon in middle Tryon and Arnold Creek primarily reflect low historical (and present) use of this portion of the subbasin for coho spawning and rearing.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Clackamas River Coho are part of the Lower Columbia River Coho Salmon ESU, which was listed as Threatened under the ESA in 2005.
- **Population Description:** The Clackamas River Coho population is designated as a Primary population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes the viability goal for this population as High+.
- **Recovery Goal for Abundance:** NA; the current abundance is 1,684, the viable abundance is 600 and the potential abundance is 4,000 (personal communication, Todd Alsbury, ODFW).
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity:** Lower river – Productivity: 1.8, Capacity: 700; Upper river – Productivity: 4.7, Capacity: 2202.

2.2 Current Hatchery Programs Affecting this Population

The Eagle Creek National Fish Hatchery segregated harvest coho program releases 500,000 coho salmon smolts (12 fpp) on-site at Eagle Creek (Rkm 16), a tributary to the Clackamas River from March through May (HGMP 2004). All juvenile coho salmon released into Eagle Creek are marked by an adipose fin clip (450,000), an adipose fin clip plus coded-wire tag (25,000), or a coded-wire tag only (CWT; 25,000 with no external fin clip). The historical parentage of coho salmon at Eagle Creek NFH is a mixture of Sandy River, Toutle River and Big Creek stocks, which were brought to the hatchery to initiate production of early-run coho salmon. Hatchery adults may spawn naturally in Eagle Creek below the hatchery and in Delph Creek.

Hatchery production dominates the Lower Columbia River coho salmon ESU. In 2002, the total expected return of hatchery coho salmon (including releases upstream of the ESU boundary) to the Columbia River basin was over a million adults (Waples et al. 2005). The paucity of naturally produced spawners in this ESU can be contrasted with the very large number of hatchery-produced adults. However, on the Oregon side of the Columbia River, the hatchery adults are generally concentrated in the Youngs Bay area in the estuary and in the vicinity of Bonneville Dam (personal communication, Todd Alsbury, ODFW). Although the scale of the hatchery programs and the great disparity in relative numbers of hatchery and wild fish produce many genetic and ecological threats to the natural populations, the BRT concluded that collectively these hatchery populations contain a great deal of genetic resources that might be

tapped to help promote restoration of more widespread naturally spawning populations (Waples et al. 2005).

There are no coho programs within the lower Willamette River tributaries. There is little evidence of marked hatchery coho straying into these tributaries (personal communication, Todd Alsbury, ODFW).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: Lower Clackamas: 780 fish; Upper Clackamas: 0 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.8 to 1.5 in the lower Clackamas and remain the same in the upper Clackamas. Average abundance of natural origin spawners (NOS) would decrease in the lower Clackamas from approximately 284 fish to approximately 211 fish and remain the same in the upper Clackamas. Harvest contribution of the natural and hatchery populations would go from approximately 4,685 fish to approximately 324 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals: however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Lower Clackamas River Population Component (downstream of River Mill Dam)

The lower river population component of coho is dominated by hatchery-origin spawners. Recent spawning surveys for coho in tributaries of the lower Clackamas River (2002-2004) estimated that hatchery fish constituted 37 to 77% of all natural spawners. The coho program at Eagle Creek National Fish Hatchery (500,000 smolts) is operated consistent with a Stabilizing designation for the lower river population component. The current hatchery program would not be consistent with either a Primary or Contributing designation for the lower Clackamas coho population component. Under current habitat conditions, an integrated hatchery program could not be supported; however, with improved habitat conditions, an integrated program may be feasible.

Upper Clackamas River Population Component (upstream of North Fork Dam)

The upper Clackamas River is managed for wild fish production. All marked hatchery-origin coho are excluded from the upper river at North Fork Dam. In recent years, very few hatchery-origin coho have been intercepted at North Fork Dam. For example, from 2004-2005, only two marked adult coho were intercepted each year at the dam. Consequently, there appears to be little or no straying of hatchery-origin coho into the upper Clackamas River. Because all marked hatchery-origin coho are excluded from the upper river, the hatchery program in the lower river (Eagle Creek NFH) is operated consistent with a Primary population designation for the upper river population component.

Recommendations

Lower River Population Component

Managers should consider whether harvest goals could be met with a smaller program at the Eagle Creek NFH. The current program is based on an on-station release of 500,000 yearling smolts. If recovery goals for the lower Clackamas River are developed in the future, the hatchery program will need to be managed consistent with those goals.

Managers should also consider developing an integrated hatchery program to replace the current segregated program in the lower river after habitat conditions are improved and the lower river is capable of supporting a viable, self-sustaining population. Reducing on-station releases would also reduce the proportion of natural spawners composed of hatchery-origin fish. Unlike the current program which uses an introduced non-Clackamas River stock, an integrated hatchery program could provide both conservation and harvest benefits.

Upper River Population Component

The HSRG offers no specific recommendations for modifying this population component.

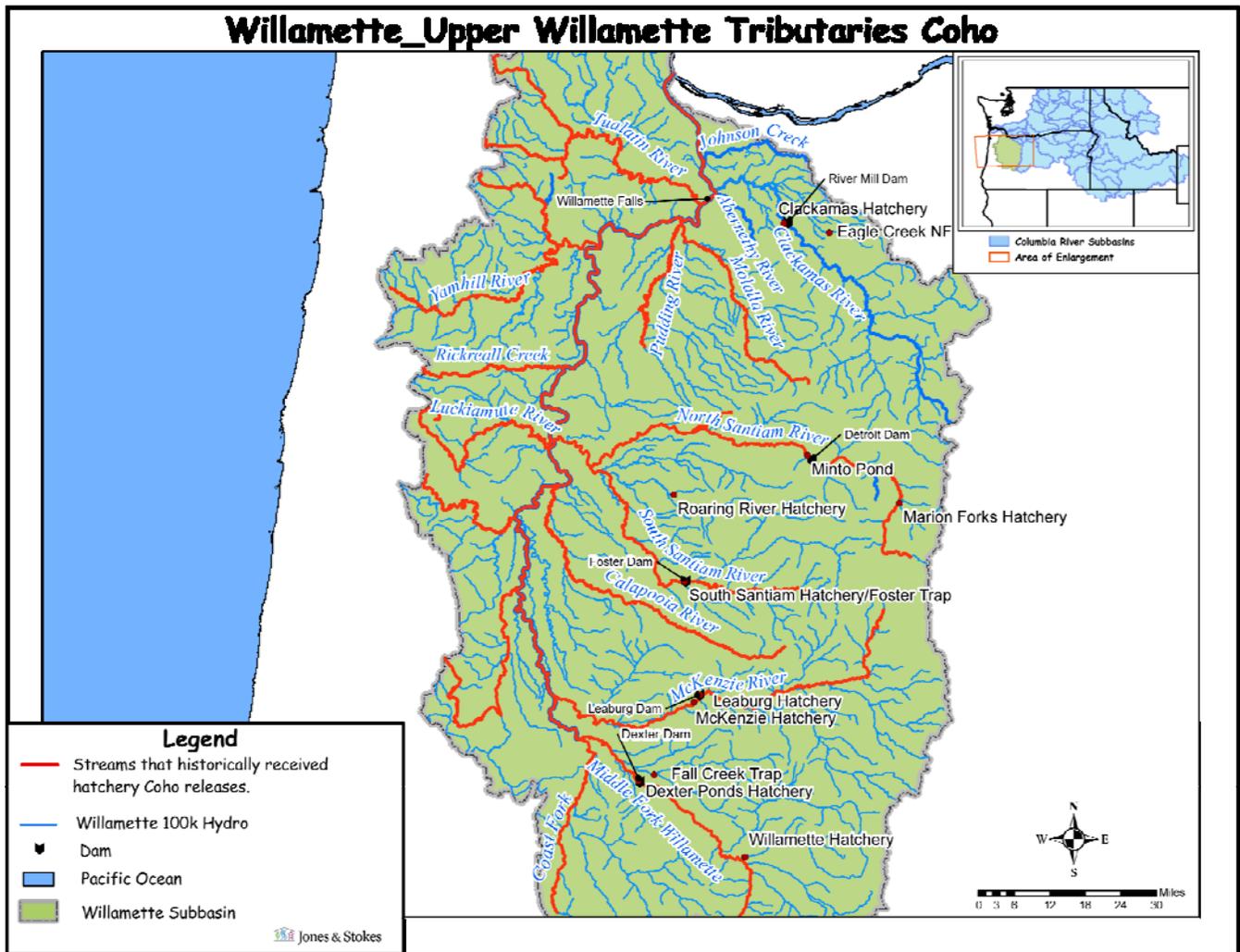
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Clackamas River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | L Clackamas None | - | 0% | 0% | 69% | 0.00 | 284 | 0.8 | 53 | 0 |
| | U Clackamas None | - | 0% | 99% | 0% | 1.00 | 1,538 | 3.9 | 288 | 0 |
| | Seg Harv | 349.1 | 85% | | | | | | 4,344 | 2,214 |
| No Hatchery | L Clackamas None | - | 0% | 0% | 0% | 1.00 | 211 | 1.5 | 40 | - |
| | U Clackamas None | - | 0% | 99% | 0% | 1.00 | 1,538 | 3.9 | 288 | - |
| HSRG Solution | L Clackamas None | - | 0% | 0% | 66% | 0.00 | 266 | 0.8 | 50 | 0 |
| | U Clackamas None | - | 0% | 95% | 0% | 1.00 | 1,533 | 3.9 | 290 | 0 |
| | Seg Harv | 349.1 | 85% | | | | | | 5,379 | 1,371 |
| HSRG Solution w/ Improved Habitat | L Clackamas None | - | 0% | 0% | 63% | 0.00 | 297 | 0.8 | 56 | 0 |
| | U Clackamas None | - | 0% | 95% | 0% | 1.00 | 1,739 | 4.3 | 329 | 0 |
| | Seg Harv | 349.1 | 85% | | | | | | 5,379 | 1,371 |

Hatchery Scientific Review Group Review and Recommendations

Upper Willamette River Tributaries Coho Salmon Population and Related Hatchery Programs

January 31, 2009



1 Upper Willamette Tributaries Coho Salmon

This natural population represents coho salmon spawning in Willamette River tributaries above Willamette Falls. Historically, self-sustaining populations of coho salmon did not occur in the upper Willamette Basin due to passage constraints at Willamette Falls. Prior to laddering of Willamette Falls (Rkm 37), passage of returning adult salmon was only possible during winter and spring high flow periods. Thus, coho were not present until hatchery introductions occurred in tributaries upstream of the falls. Summer flows in the Willamette, primarily due to releases from the 13 multipurpose USACE dams, are higher and cooler than those before the dams were constructed. When combined with passage improvements at Willamette Falls and hatchery inputs, this improved water quality has helped establish upriver runs of coho (Altman, Henson, and Waite 1997). Hatchery-origin coho are no longer released into the upper Willamette Basin. The population currently consists of a self-sustaining population originating from hatchery outplants.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: The Upper Willamette Tributaries coho are not part of any coho salmon ESU.
- Population Description: The Upper Willamette Tributaries coho population is not designated as a population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004).
- Recovery Goal for Abundance: NA
- Productivity Improvement Expectation: NA
- Habitat Productivity and Capacity: Unknown

2.2 Current Hatchery Programs Affecting this Population

- Currently, there are no coho hatchery programs in the Upper Willamette River basin.
- While there are many coho hatchery programs in the lower Columbia River and at Eagle Creek NFH in the Clackamas subbasin, it is assumed that few coho from these programs stray into the upper Willamette Basin.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 4 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value

of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.3. Average abundance of natural-origin spawners (NOS) would increase from approximately 6 to 17 fish. Harvest contribution of the natural and hatchery populations would go from 1 fish to 3 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Currently, there are no coho hatchery programs in the Upper Willamette River basin. Coho observed passing upstream of Willamette Falls are thought to be naturalized progeny of hatchery plants.

Recommendations

The HSRG has no specific recommendations for this population.

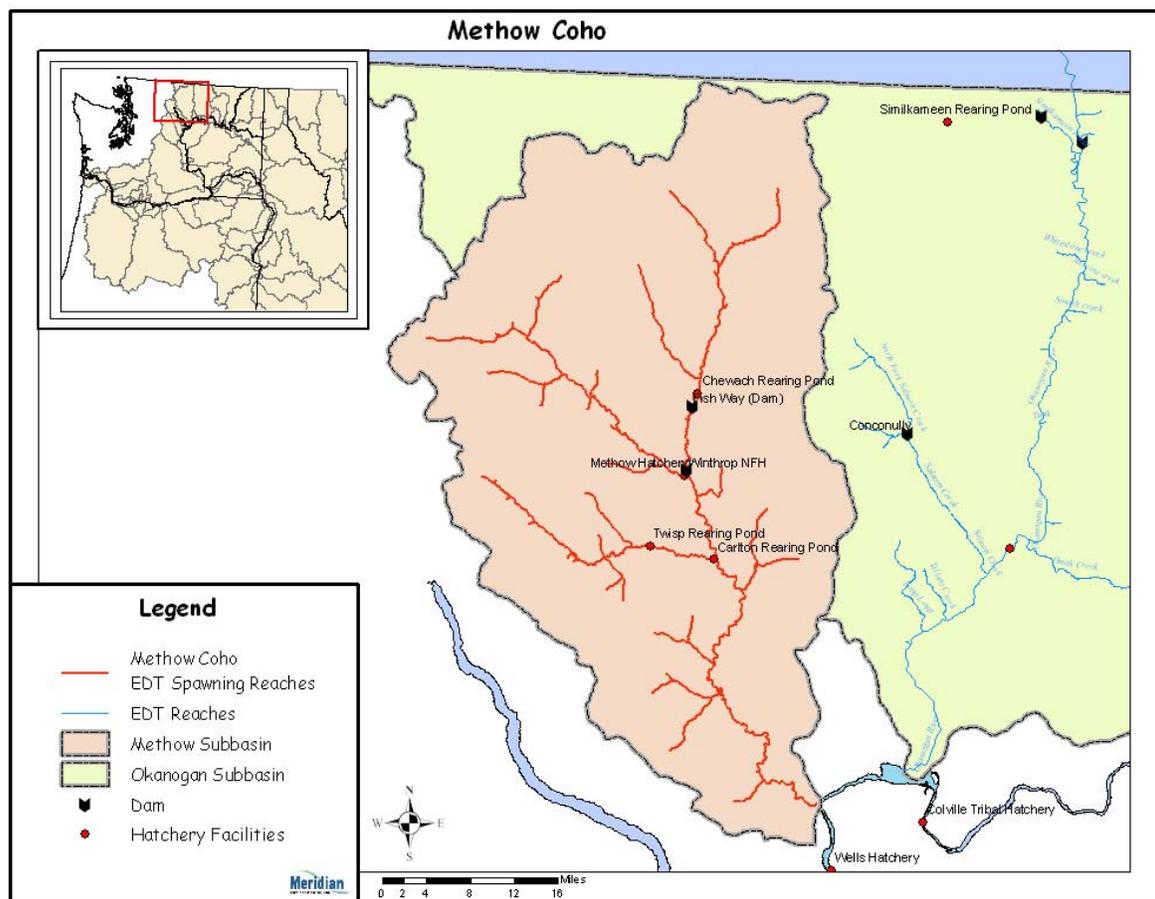
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Upper Willamette River Tributaries Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 36% | 0.00 | 6 | 0.6 | 1 | 0 |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 17 | 1.3 | 3 | - |
| HSRG Solution | None | - | 0% | 0% | 36% | 0.00 | 5 | 0.6 | 1 | 0 |
| | None | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None | - | 0% | 0% | 31% | 0.00 | 6 | 0.7 | 1 | 0 |
| | None | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Methow River Coho Population and Related Hatchery Programs

January 31, 2009



1 Methow River Coho

The Methow River Coho natural population was extirpated prior to 1950, but has been reintroduced by the Yakama Nation. A major cause of the coho extirpation was likely a dam built near Pateros, Washington by Washington Water Power that blocked adult and migration from 1915-1929. Historically, it was estimated that from 23,000-31,000 coho spawned in the Methow River subbasin (NPPC 2004). Researchers reported that coho were of equal size to the spring Chinook native to the basin. Additionally, it was thought that the basin supported more coho than spring Chinook or steelhead.

2 Current Conditions

Methow coho spawn in the mainstem Methow River and small tributaries such as Gold Creek. As the reintroduction progresses, it is expected that coho will begin using other streams.

Coho salmon return to the subbasin in mid-September through late November. Spawning generally begins in October and continues into December. Because of cold water temperatures present at spawning time, coho may be targeting areas of warmer groundwater for redd construction. Juvenile (yearling) coho begin migrating out of the system between March and April.

Current coho production consists primarily of hatchery fish, but some natural production is also occurring as a result of reintroduction efforts.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Not listed
- Population Description: Mixed stock of both hatchery and limited natural production. The HSRG has classified this population as Stabilizing.
- Recovery Goal for Abundance: Not applicable
- Productivity Improvement Expectation: Unknown until more years of data becomes available regarding program success. Habitat in the Methow is expected to improve from actions designed to increase the abundance and productivity of listed steelhead and spring Chinook.
- Habitat Productivity and Capacity: Productivity: 1.38; Capacity: 1,514

2.2 Current Hatchery Programs Affecting this Population

The Yakama Nation coho reintroduction program releases juvenile hatchery coho into the Methow River. A description of this program is presented below.

Little White Salmon/Willard National Fish Hatchery (Yakama Coho): Broodstock for the Methow River component of the program may be collected at Wells Dam, Winthrop National Fish Hatchery, Twisp River Adult Weir, Chewuch River Adult Weir, and Foghorn Dam. Egg incubation and rearing can occur at the Cascade Fish Hatchery, Willard National Fish Hatchery and Winthrop National Fish Hatchery. Although juvenile releases are expected to vary over time as natural production increases, the program currently releases approximately 400,000 coho to the subbasin. The current program has an R/S of 2.0.

The current program is part of a four phase reintroduction program that includes two broodstock development phases along with two natural production phases. A 10 – 15 year habitat improvement phase is also planned.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 92 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 49 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.5 to 0.9. Average abundance of natural-origin spawners (NOS) would decrease from approximately 83 fish to approximately 1 fish. Harvest contribution of the natural and hatchery populations would go from approximately 618 fish to zero fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution

(Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The purpose of this program is to reestablish naturally reproducing coho salmon in the Methow River, with numbers at or near carrying capacity, that provide opportunities for significant harvest for Tribal and non-Tribal fishers. Historically, the Methow River supported a coho population of between 23,000 and 31,000 fish. The current program is part of a four phase reintroduction program that includes two broodstock development phases along with two natural production phases. The natural sustainability of this population is uncertain given the early stage of the reintroduction program.

In the broodstock development phase, the program would transition from the use of lower Columbia River hatchery stocks to a Methow River hatchery stock. Once the hatchery stock is established, natural production phases will outplant juveniles into key coho habitat in the Methow River, Chewuch River, Twisp River, and Wolf Creek. Juvenile releases during this phase would total approximately 1.0 million smolts. Broodstock protocols for this phase would achieve a PNI of approximately 10% (pNOB = 10%, pHOS = 90). The next support phase would reduce production to approximately 700,000 smolts with broodstock protocols to achieve a PNI of approximately 32% (pNOB = 35%, pHOS = 65%). The final support phase would reduce smolt production to approximately 350,000 fish with broodstock protocols to achieve a PNI > 0.5 (pNOB = 80%, pHOS = 60%). The final phase would eliminate hatchery releases altogether. Currently, the program produces 500,000 smolts released at Winthrop NFH and Wells Hatchery. Broodstock for the current program is collected at Winthrop NFH and Wells Dam, and approximately 50-75% of fish are reared in the upper Columbia River Basin.

This appears to be a well thought-out reintroduction program that emphasizes developing locally adapted populations, first in the hatchery, then in the natural environment. Preliminarily, the program appears to be having success; however, planning to allow a high proportion of hatchery spawners in the second support phase provides no opportunity for the population to adapt to the local natural environment. A PNI greater than 0.5 is necessary for the natural environment to drive adaptation and increase fitness.

Recommendations

Managers should identify additional rearing locations in the upper Columbia River.

The program should be phased to achieve a PNI of 0.5 as rapidly as possible.

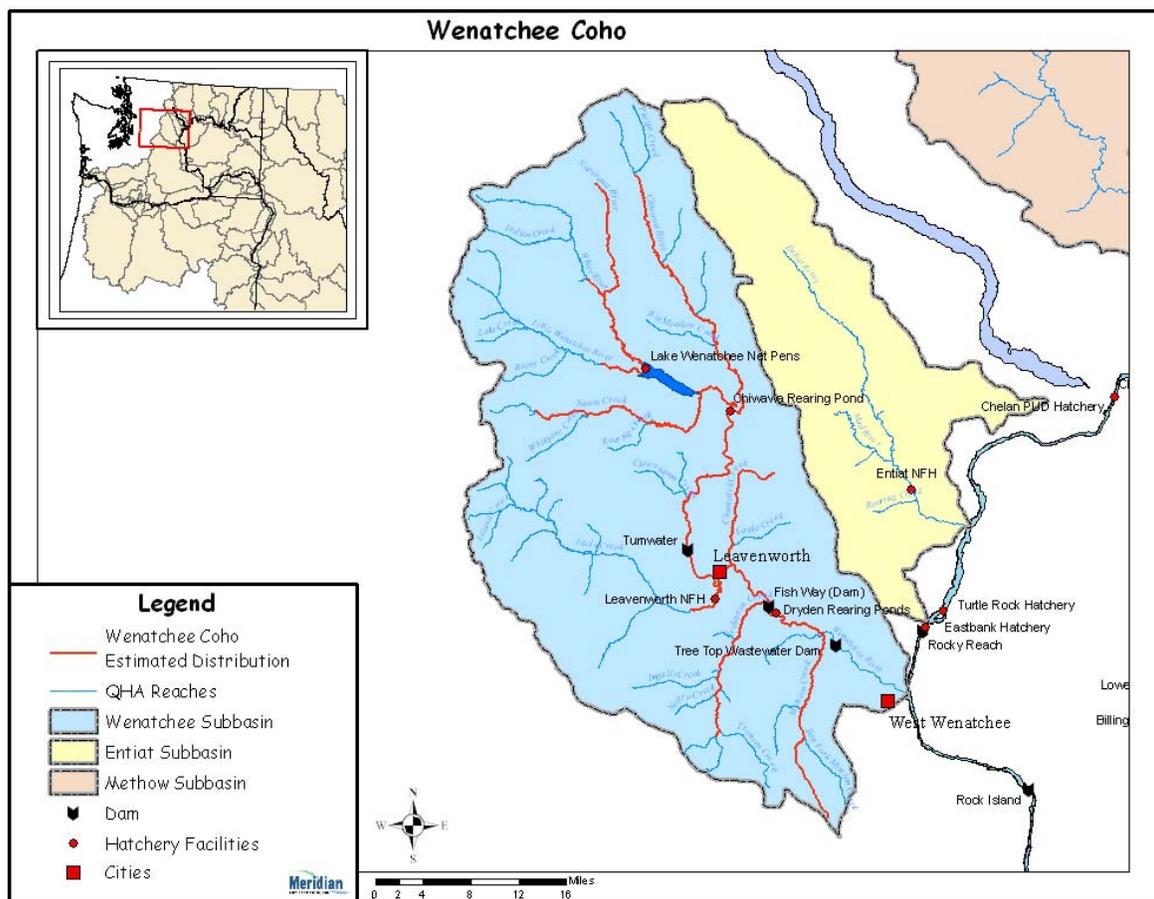
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Methow River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 495 | 90% | 0% | 58% | 0.02 | 83 | 0.5 | 618 | 244 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1 | 0.9 | 0 | - |
| HSRG Solution | Int Cons | 495 | 90% | 0% | 58% | 0.02 | 83 | 0.5 | 618 | 244 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 495 | 90% | 0% | 54% | 0.02 | 97 | 0.5 | 627 | 244 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Wenatchee River Coho Population and Related Hatchery Programs

January 31, 2009



1 Wenatchee River Coho

The natural population of Wenatchee River coho was extirpated prior to 1950, but has been reintroduced by the Yakama Nation. Historically, it was estimated that from 6,000 to 7,000 coho spawned in the Wenatchee River subbasin (NPPC 2004). Spawning likely took place in the mainstem Wenatchee River, Icicle Creek, Nason Creek, the Little Wenatchee River, Beaver Creek and other small tributaries.

2 Current Conditions

Wenatchee coho spawn in the mainstem Wenatchee River (Cashmere to Lake Wenatchee), Little Wenatchee River, Nason Creek, Beaver Creek, Icicle Creek, Peshastin Creek, Mission Creek, and Chiwaukum Creek.

Coho salmon return to the subbasin in mid-September through late November. Spawning generally begins in October and continues into December. Because of cold water temperatures at this time, coho may be targeting areas of warmer groundwater for redd construction. Juvenile (yearling) coho begin migrating out of the system between March and April.

Current coho production consists primarily of hatchery fish, but some natural production is also occurring as a part of reintroduction efforts. The first generation of naturally-produced juveniles in the subbasin emigrated in 2002. Coho run-size to the subbasin has been between 350 and 5,000 adults.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Not listed
- Population Description: Mixed stock of both hatchery and limited natural production. The HSRG has classified this population as Stabilizing.
- Recovery Goal for Abundance: Not applicable
- Productivity Improvement Expectation: Unknown until more years of data becomes available on program success. Habitat in the Wenatchee River is expected to improve from actions designed to increase the abundance and productivity of listed steelhead and spring Chinook.
- Habitat Productivity and Capacity: Productivity: 1.49; Capacity: 2,093

2.2 Current Hatchery Programs Affecting this Population

The Yakama Nation coho reintroduction program releases juvenile hatchery coho into the Wenatchee River.

Little White Salmon/Willard National Fish Hatchery (Yakama Coho): Broodstock for the Wenatchee River component of this program may be collected at Dryden Dam, Tumwater Dam or the Leavenworth National Fish Hatchery. Spawning takes place at the Entiat National Fish Hatchery. Egg incubation may occur at the Peshastin Incubation Facility or at the Entiat National Fish Hatchery. Juvenile rearing can occur at the Cascade and Willard fish hatcheries. Approximately 1.1 million fish are released each year to the Wenatchee River, Nason Creek, Coulter Creek, Beaver Creek and Icicle Creek. Fish are 100% coded-wire tagged but not adipose fin-clipped.

The current program is part of a four phase reintroduction program that includes two broodstock development phases along with two natural production phases. A 10- to 15-year habitat improvement phase is also planned. The current program has an R/S of 8.0.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 4,888 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs : 4 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects. Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.5 to 1.1. Average abundance of natural-origin spawners (NOS) would decrease from approximately 775 fish to approximately 73 fish. Harvest contribution of the natural and hatchery populations would go from approximately 3,575 fish to approximately 34 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The purpose of this program is to reestablish naturally reproducing coho salmon in the Wenatchee River, with numbers at or near carrying capacity, that provide opportunities for significant harvest for Tribal and non-Tribal fishers. Historically, the Wenatchee River supported a coho population of between 6,000 and 7,000 fish. The current program is part of a four-phase reintroduction program that includes two broodstock development phases along with two natural production phases. The natural sustainability of this population is uncertain given the early stage of the reintroduction program.

In the broodstock development phase, the program transitioned from the use of lower Columbia River hatchery stocks to a Wenatchee River hatchery stock. This goal has been achieved. Once the hatchery stock is established, natural production phases will outplant juveniles into key coho habitat in the Chiwawa, White, and Little Wenatchee rivers, as well as Nason Creek. Juvenile releases during this phase would total approximately 1.1 million smolts. Broodstock protocols for this phase would achieve a PNI of approximately 10% (pNOB = 10%, pHOS = 90%). The next support phase would reduce production to approximately 800,000 smolts with broodstock protocols to achieve a PNI of approximately 32% (pNOB = 35%, pHOS = 65%). The final support phase would reduce smolt production to approximately 400,000 fish, with broodstock protocols to achieve a PNI > 0.5 (pNOB = 80%, pHOS = 60%). The final phase would eliminate hatchery releases altogether.

Currently, the program produces one million smolts released at Leavenworth NFH and multiple sites above Tumwater Dam. Broodstock for the current program is collected at Dryden Dam, Tumwater Dam and the Leavenworth NFH. Juveniles are reared out of basin and smolts are acclimated and released in basin.

This appears to be a well thought-out reintroduction program that emphasizes developing locally adapted populations, first in the hatchery and then in the natural environment. Preliminarily, the program appears to be successful. However, planning to allow a high proportion of hatchery spawners in the second support phase provides no opportunity for the population to adapt to the local environment. A PNI greater than 0.5 is necessary for the natural environment to drive adaptation and increase fitness. Excess hatchery origin fish could be available for harvest, donation to food banks or stream nutrification.

Recommendations

Managers should identify additional rearing locations in the upper Columbia River.

The program should be phased to achieve a PNI of 0.5 as rapidly as possible.

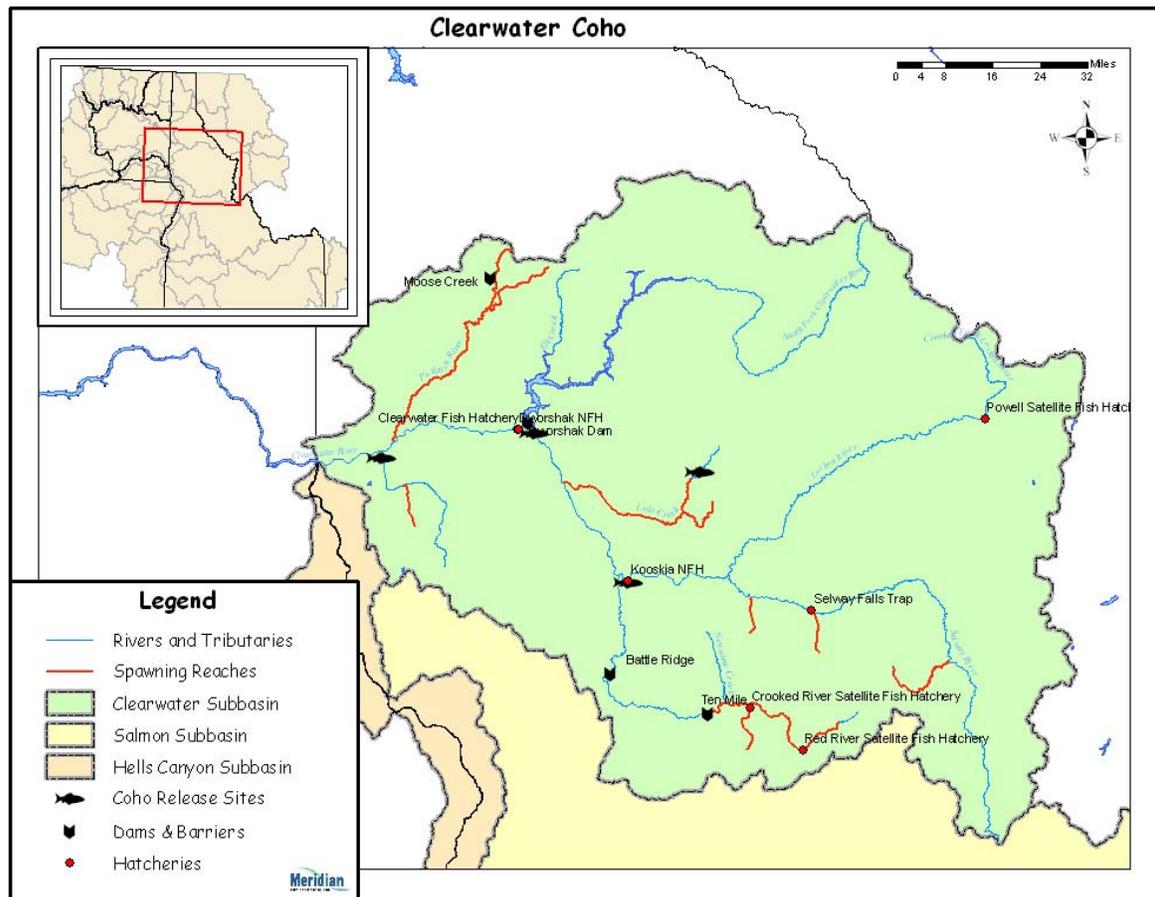
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Wenatchee Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 1,048 | 30% | 0% | 83% | 0.04 | 775 | 0.5 | 3,575 | 1,041 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 73 | 1.1 | 34 | - |
| HSRG Solution | Int Cons | 1,048 | 30% | 0% | 83% | 0.04 | 775 | 0.5 | 3,575 | 1,041 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 1,048 | 30% | 0% | 82% | 0.04 | 861 | 0.6 | 3,615 | 1,041 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Clearwater River Coho Population and Related Hatchery Programs

January 31, 2009



1 Clearwater River Coho

Clearwater River coho salmon are not considered part of the Lower Columbia River ESU.

Historically, coho salmon were abundant in the lower Snake River Basin and were known to spawn in the Clearwater, North Fork Clearwater, South Fork Clearwater, Lochsa, and Selway rivers (Nez Perce Tribe and FishPro 2004). In 1910, the construction of Harpster Dam completely blocked coho salmon access into the South Fork Clearwater River. In 1927, Inland Power and Light Company completed Lewiston Dam at River Mile 4.0 on the Clearwater River. The dam included a fish ladder, but it was inadequate, virtually eliminating coho salmon runs into the Clearwater subbasin. While improvements were made to the fish ladder in subsequent years, attempts to reintroduce coho into the South Fork Clearwater River met with little success. After Harpster Dam was removed in 1963 and Lewiston dam was removed in 1973, there was no observed increase in coho salmon abundance¹. The native Clearwater River coho population was never listed under the Endangered Species Act (ESA), and was considered extinct when the last coho crossed the Lower Granite Dam in 1986. Even though coho salmon are listed as threatened in the lower Columbia River, reintroduced coho in the Clearwater subbasin are considered out-of-ESU and are not listed.

In 1995, the Nez Perce Tribe began a coho reintroduction program in the Clearwater River subbasin using coho reared at Mitchell Act hatcheries in the lower Columbia River. By 1998, this agreement provided an annual transfer of 550,000 coho salmon smolts from the Eagle Creek National Fish Hatchery (NFH) for release in the Clearwater River subbasin. Eagle Creek Hatchery broodstock was initially selected because of its early run timing that is probably similar to historic runs in the Clearwater River. Consistent with the Clearwater Subbasin Plan (Nez Perce Tribe and FishPro 2004), the Nez Perce Tribe envisions developing an annual escapement of 14,000 coho salmon to the Clearwater subbasin.

2 Current Conditions

Coho salmon in the Clearwater River subbasin are currently maintained through an integrated reintroduction hatchery program involving the Dworshak, Kooskia and Eagle Creek NFHs. To date, the reintroduction program has been moderately successful. Over the past 5 years (2003 through 2007), adult coho counts at Lower Granite Dam have averaged over 2,100 fish². In 2004, adult returns reached a high of 3,898 at Lower Granite Dam; 2,104 of these were trapped at Clearwater weirs with 419 females spawned to produce almost 900,000 eggs. A total of 498 adults were passed at weirs to spawn naturally and at least 35 redds were counted in tributary streams. In 2005, adult spawning was observed in the Potlatch River, Lapwai Creek, Lolo Creek, Clear Creek, and the South Fork Clearwater River (Nez Perce Tribe 2005). An important goal of this program is to develop a localized broodstock.

AHA modeling data submitted by IDFG estimates current adult escapement and adjusted productivity for the natural-origin population at 346 and 0.58, respectively.

¹ <http://www.nwcouncil.org/history/Extinction.asp>

² http://www.fpc.org/adultsalmon/adultqueries/Adult_Annual_Totals_Query_form.html

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Not listed
- Population Description: For the HSRG review, the population has been classified as a Stabilizing population.
- Recovery Goal for Abundance: NA
- Productivity Improvement Expectation: NA
- Habitat Productivity and Capacity is estimated as: Productivity: 1.5; Capacity: 1,000

2.2 Current Hatchery Programs Affecting this Population

The integrated coho salmon program includes a smolt release sourced from the Eagle Creek NFH and a locally adapted (Clearwater stock) program that generates smolts from adults trapped at Snake and Clearwater facilities.

1) Smolts reared at the Eagle Creek NFH are transferred and released directly to Clear Creek, the Middle Fork Clearwater River, and Lapwai Creek. The current release goal for Lapwai Creek and for the Middle Fork Clearwater River/Clear Creek sites is 275,000 smolts each (550,000 total smolts). Coho smolts are not adipose fin-clipped. Depending on funding, release groups may receive evaluation tags (coded wire-tags and PIT-tags).

2) Adult broodstock collected from returns to Dworshak NFH, Kooskia NFH, the Nez Perce Tribal Hatchery, and Lyons Ferry Hatchery in Washington are transferred to the Dworshak facility for holding and spawning. Additional eyed-eggs may be transferred to the Dworshak facility from Eagle Creek NFH to better address production objectives. Fish rear through early spring at the Dworshak when they are transferred to the Kooskia NFH following the release of spring Chinook smolts from that facility. Coho acclimate for approximately 3-5 weeks before being released in Clear Creek and the Middle Fork Clearwater River. The smolt production goal for the locally adapted program is approximately 280,000. Coho smolts are not adipose fin-clipped. Depending on funding, release groups may receive evaluation tags (coded wire-tags and PIT-tags).

3) Approximately 30,000 coho salmon eggs are transferred to the Potlatch Corporation which operates an educational outreach program. Subyearlings generated by this program are planted in Orofino Creek.

Coho smolts are not adipose fin-clipped. Depending on funding, release groups may receive evaluation tags (coded wire-tags and PIT-tags).

The coho program has an R/S of 4.0.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 1,192
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 0

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of

the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008). Our analysis estimated that Adjusted Productivity (with harvest and fitness effects from AHA) would increase from 0.6 to 1.2. Average abundance of natural-origin spawners (NOS) would decrease from approximately 346 fish to approximately 100 fish. The harvest contribution of the natural and hatchery populations would go from approximately 637 fish to approximately 27 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Clearwater River coho that emphasizes maintaining existing natural spawning populations, and using hatchery-origin coho salmon in an attempt to augment natural production.

Coho salmon were extirpated upstream of Lower Granite Dam in the mid-1980s. In 1995, in cooperation with the USFWS and the IDFG, the Nez Perce Tribe initiated a coho salmon reintroduction program in the Clearwater subbasin.

Current production plans include transferring approximately 550,000 smolts from the USFWS Eagle Creek NFH for planting in Lapwai Creek and Clear Creek. Additionally, the Nez Perce Tribe is developing a locally adapted broodstock from returning adults (both first generation returns from Eagle Creek outplants and from returning adults produced via natural spawning). Adults appear to be returning to capture sites in sufficient numbers to begin transitioning to locally adapted broodstock. The broodstock production program has begun this process with a smolt production target of about 280,000 smolts.

Eagle Creek smolts are trucked from the USFWS facility in the Clackamas River system and released directly to receiving streams. Locally produced smolts are sourced from spawning events at the Dworshak NFH. Juveniles rear at Dworshak and acclimate for 3-5 weeks at the Kooskia NFH before being released to the Middle Fork Clearwater River or Clear Creek. Broodstock for the local program could be collected at four facilities: Lyons Ferry Hatchery, Nez Perce Tribal Hatchery, Dworshak NFH, and Kooskia NFH.

A small educational program operated by the Potlatch Corporation is provided approximately 30,000 eggs. Fry produced in this program are planted in Orofino Creek.

Recommendations

This is a reintroduction program to develop self-sustaining populations. The HSRG recommends that managers establish locally adapted adult returns to meet all broodstock needs for this program. This could best be accomplished by (a) emphasizing adult returns for broodstock from all adult capture facilities; and (b) releasing any additional Eagle Creek smolts exclusively at facilities where broodstock subsequently could be collected (e.g., Nez Perce Tribal Hatchery, Dworshak National Fish Hatchery, Kooskia National Fish Hatchery). Initially the primary focus of this program should be to establish a locally adapted hatchery population. As managers build returns of locally adapted hatchery-origin adults, phase out the importation of out-of-basin coho. Once adults return in excess of broodstock needs, adults could be outplanted or some of the smolt production could be allocated to tributary releases. The final step would be to transition from locally adapted segregated hatchery broodstock to a well integrated program. A PNI greater than 0.5 is necessary for the natural environment to drive adaptation and increase fitness. To be most successful, managers should reestablish their monitoring and evaluation program.

The managers should coordinate the programming of all salmon populations reared in the Clearwater Fish Hatchery, Dworshak National Fish Hatchery, Kooskia National Fish Hatchery and Nez Perce Tribal Hatchery to maximize the benefits of available water supply, appropriate water temperature, and rearing containers. Operating these four major hatcheries as a coordinated system would facilitate the movement of

programs/populations between and among the different hatcheries. This would maximize survival by producing fish in good condition for release at the appropriate life stage.

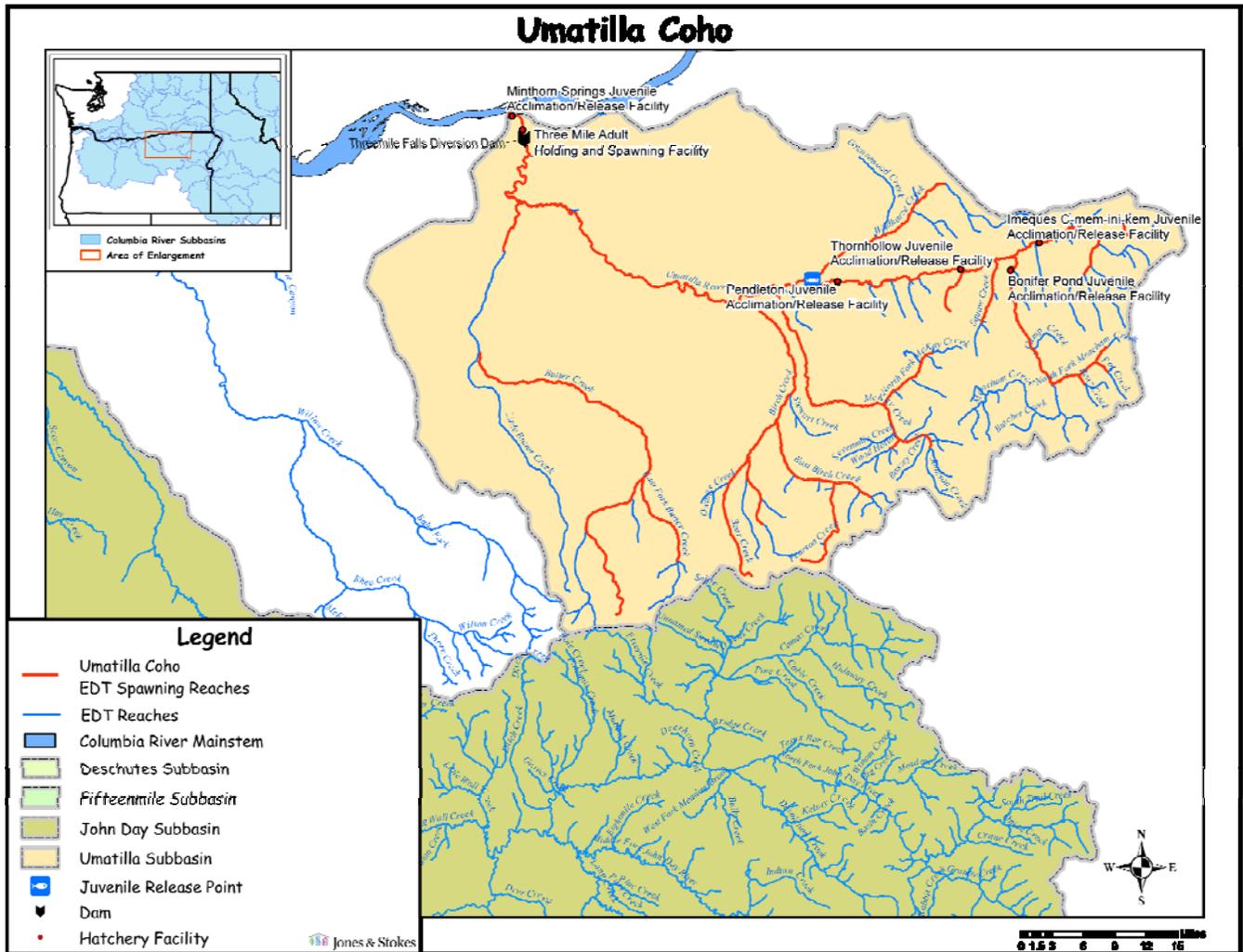
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Clearwater Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | Int Cons | 833.9 | 40% | 0% | 73% | 0.0 | 346 | 0.58 | 637 | 550 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.0 | 100 | 1.15 | 27 | - |
| HSRG Solution | Int Cons | 830.1 | 40% | 0% | 80% | 0.0 | 405 | 0.58 | 1,018 | 589 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 830.1 | 40% | 0% | 78% | 0.0 | 448 | 0.64 | 1,030 | 589 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Umatilla River Coho Population and Related Hatchery Programs

January 31, 2009



1 Umatilla Coho

The Umatilla/Willow subbasin is a 3,714 square mile area in northeastern Oregon situated primarily in Umatilla and Morrow counties, with a small portion extending into Union County. The Umatilla/Willow subbasin is composed of four drainages: the Umatilla subbasin, the Willow Creek subbasin, the Six-Mile Canyon drainage, and the Juniper Canyon drainage. The mainstem Umatilla River is 89 miles long and the river and its tributaries drain an area of nearly 2,290 square miles. Willow Creek is 79 miles long and drains an area of about 880 square miles. The Six-Mile Canyon area, which contains intermittent streams that rarely drain into the Columbia River, is 472 square miles. The mainstem of Juniper Canyon Creek is 19 miles long and drains 72 square miles (Umatilla Subbasin Plan 2004).

Habitat degradation due to agricultural water withdrawal, construction of Three Mile Dam at RM 4, and forest management practices led to the extirpation of salmon from the Umatilla subbasin in the early 1900s (Umatilla Subbasin Plan 2004). No records exist specifically stating that coho inhabited the subbasin, but observed dates of historical spawner returns have led to the conclusion that the returns were coho. Hatchery releases began in 1966, were discontinued in 1969 and then reinitiated in 1987 until the present. Coho returning to spawn typically enter the river between September and mid-December and spawn shortly after from October to December.

Adult coho counts at Three Mile Dam began in 1988 and show an average return of 3,669 fish, with a low of 356 in 1992 and an extreme high of 22,792 in 2001. Because no hatchery releases are marked, it is unclear how many of the returning spawners are of hatchery origin versus natural production. EDT model runs show productivity below one, which indicates that limiting environmental factors won't allow for a self-sustaining natural population.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Naturally spawning coho in the Umatilla system are the result of hatchery plants and are not included in any ESU nor listed under the ESA.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the lower Columbia and Willamette arrives at a designation of Stabilizing.
- **Current Viability Rating:** Unknown
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (from EDT):** Productivity: 0.44, Capacity: 1,939

2.2 Current Hatchery Programs Affecting this Population

Releases of Tanner Creek coho (Stock 014) from the Bonneville Hatchery have been a yearly occurrence since 1987 in addition to several releases in 1966 -1969. Approximately 5,000 adults are collected from marked hatchery fish returning to Bonneville Hatchery on Tanner Creek of which ~1,200 go toward the Umatilla program. Prior to 1996, broodstock was collected at Cascade Hatchery but collection has since shifted to the Bonneville Hatchery. Broodstock collection takes place in October, November and sometimes in December. Broodstock currently is collected and held at the Bonneville Hatchery and spawned randomly when ripe. Only

hatchery-marked fish are spawned. Mating is 1:1 male to female with a 10% jack component. Once fertilized, eggs are transferred to the Oxbow facility operated by ODFW and the Cascade Hatchery operated by USFS where they are reared until mid-February or mid-March for transfer to the Pendleton acclimation site and a final 1-month rearing period. It is reported that 1,286,158 smolts at 16.3 fpp (1998-2003 averages) (Umatilla Coho HGMP 2004) are volitionally released directly into the Umatilla River from Pendleton in two distinct releases. HGMP goals call for an initial release composed of 250,000 juveniles from Oxbow and 700,000 juveniles from Cascade. After the first release has cleared from the acclimation site, another 500,000 juveniles are transferred from Cascade in mid-March for a 1-month rearing period and release in mid-April. Only 75,000 of the 1.5 million fish released are marked with adipose clip and coded-wire tag. The remainder of the release is unmarked.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 6,782 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.2 to 0.3. Since the estimated productivity of the habitat is less than one, absent the hatchery program, the average abundance of natural-origin spawners (NOS) would decrease from approximately 530 fish to zero. Harvest contribution of the natural and hatchery populations would go from approximately 3,200 fish to zero.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Management goals are to reintroduce a sustainable natural coho population and provide harvest opportunities. As currently operated, the program does not meet the sustainable natural population goal. The program also provides minimal harvest despite the fact that fish are available for harvest. The size of the harvest program (approximately 1.5 million smolts) creates an ecological risk to other populations in the watershed. In addition, the absence of mass-marking makes it impossible to evaluate the composition of natural spawning and the success of reintroduction efforts.

All broodstock is taken annually from the Bonneville Hatchery Complex; none is taken locally. The continued use of this out-of-basin broodstock may be leading to low survival rates and reduced fishery contribution. Developing a local broodstock may increase productivity of the hatchery population and allow harvest goals to be met with a smaller program.

There has been little monitoring of this population, particularly the performance of fish reproducing in the natural environment. Given current habitat conditions and productivity, it is unlikely that that a sustainable coho population could be developed.

Recommendations

Collect broodstock from adults returning to Three Mile Dam. Adipose-mark all released juveniles in order to evaluate composition on the spawning grounds, reproductive success in the natural environment, and to increase harvest opportunities.

Shift the program to local hatchery broodstock and allow returning fish to spawn naturally. Initially allow all hatchery fish not needed for broodstock to spawn naturally. Once naturally produced fish can be identified, develop a plan to evaluate habitat productivity and develop a locally adapted stock. If sufficient natural-origin fish return, initiate an integrated conservation program with a targeted PNI greater than 0.5. Retain a segregated harvest program using local brood and Three Mile Dam to effectively segregate and remove hatchery adults. If the habitat cannot support natural production, the managers should focus on habitat improvements and continue to operate a locally adapted hatchery program for harvest.

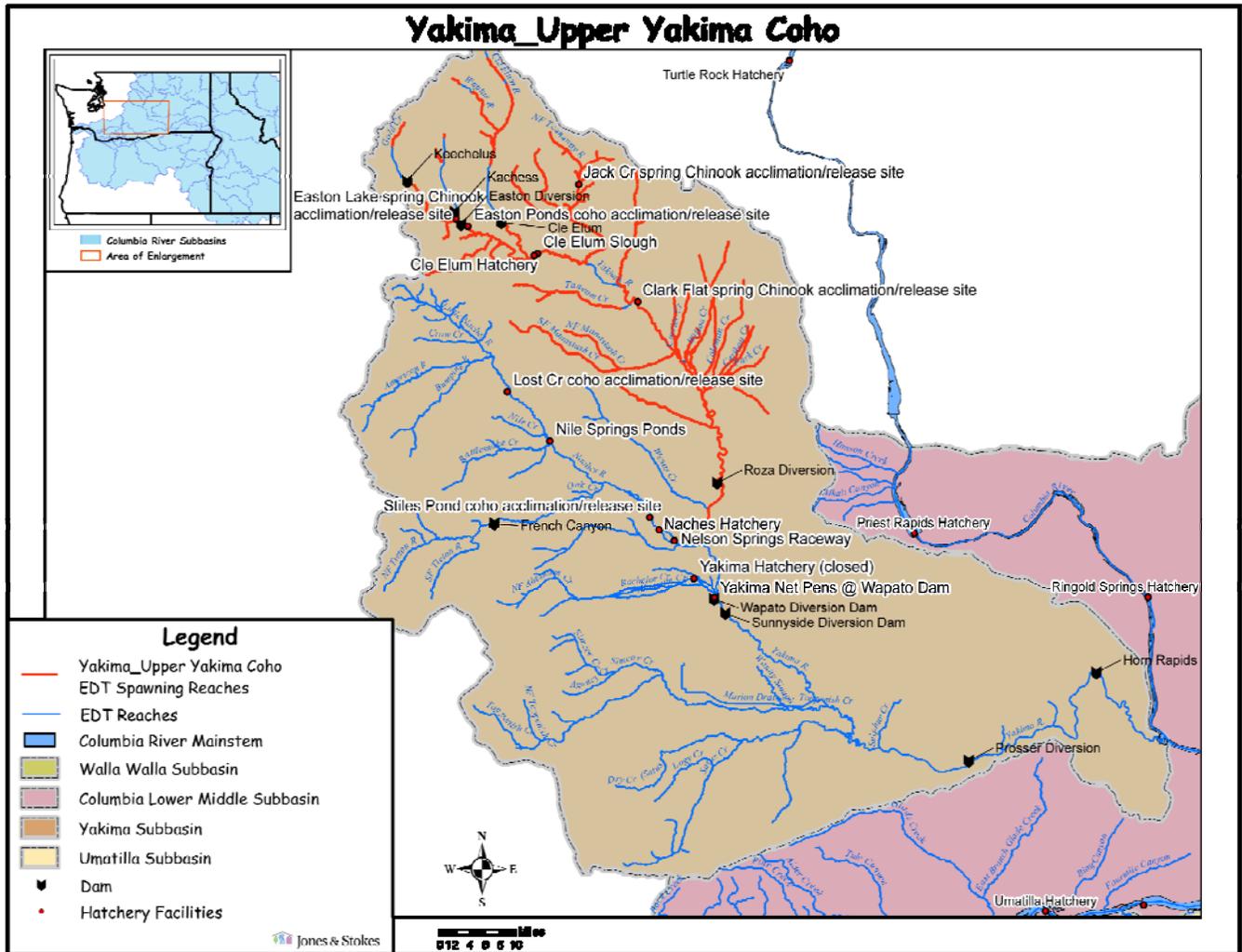
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Umatilla River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 91% | 0.00 | 530 | 0.2 | 222 | 0 |
| | Seg Harv | 1,530.0 | 0% | | | | | | 2,968 | 0 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 0 | 0.3 | 0 | - |
| HSRG Solution | None None | - | 0% | 0% | 85% | 0.00 | 175 | 0.2 | 73 | 0 |
| | Seg Harv | 1,530.0 | 50% | | | | | | 7,863 | 155 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 83% | 0.00 | 195 | 0.2 | 82 | 0 |
| | Seg Harv | 1,530.0 | 50% | | | | | | 7,863 | 155 |

Hatchery Scientific Review Group Review and Recommendations

Yakima River Coho Population and Related Hatchery Programs

January 31, 2009



1 Yakima Subbasin Coho

Although endemic coho were extirpated in the early 1980s, natural reproduction of hatchery-reared coho, outplanted as smolts, is now occurring in both the Yakima and Naches rivers. Natural reproduction is evident from the increasing occurrence of zero-aged coho parr in samples taken at numerous points in the basin (YN, unpublished data, 2000) and from the counts of unmarked adults seen at the Prosser Dam counting station (all hatchery coho released in the Yakima subbasin since 2000 have been ad-clipped or coded-wire tagged). Adult counts at Roza Dam on the upper Yakima River from 1941 - 1968 indicate that the endemic stock was early-run. The vast majority of the hatchery coho smolts out planted since 1985 have also been early-run.

Based on fragmentary WDFW records of spawner surveys, the endemic stock spawned in the upper Yakima above the Cle Elum confluence and in the Naches, primarily in the lower alluvial reaches, below the Tieton confluence. Bryant and Parkhurst (1950) reported that in the early years of the 20th century, coho also spawned in smaller tributaries of the upper Yakima, such as Taneum and Umtanum creeks. Affidavits from early settlers of the Wenatchee subbasin state that “silvers” were found in virtually every perennial creek and river in the basin prior to extensive development. It is now assumed that coho used virtually every low-gradient, perennial stream in the basin before extensive habitat alterations in the late 19th century (Yakima Subbasin Plan 1990).

A considerable portion of the current, naturalized run spawns in reaches downstream of historic production areas. This is due in part because, until 1999, the vast majority of hatchery smolts were acclimated and/or released well downstream of historic spawning areas. Releases occurred in the lower Yakima mainstem, between Sunnyside Dam (RM 103) and Granger Drain (RM 83). Since 1999, all hatchery coho have been released exclusively within the historic coho production areas: from acclimation ponds in the Naches River at RM 9 and 39, and from ponds on the upper Yakima at RM 160 and RM 180. In 1999, a radiotagging study indicated that 66% of all spawning occurred in or below the Granger Drain to Sunnyside Dam reach. By 2002 and 2003, radio-tagging data showed that the proportion of spawning in the lower Yakima mainstem had dropped to 36 and 41%, respectively, and a majority of spawning was occurring within the historic production areas of the middle Yakima, upper Yakima and Naches Rivers. The Yakima Coho Master Plan (Hubble and Woodward 2003) states that the likely reasons that ~40% of returning coho still spawn in the lower river are a lack of stamina (particularly for females) and false attraction to upper Yakima waters released through irrigation returns on the lower river.

Kreeger and McNeil (1993) and the Yakima Subbasin Plan (1990) estimate the historic coho run at 44,000 and 100,000, respectively. Since regular outplanting began in 1985, coho returns have increased steadily, climbing from 0 in 1984 to a peak of 5,700 in 2000. Few of the outplanted coho were marked until the 1998 brood year. For the years 2001 through 2008, the count of unmarked, naturally reared coho at Prosser Dam on the lower Yakima (RM 47) ranged from 309 to 1,820, with a mean NOR return of 1,326. Total returns (hatchery + natural) during this period ranged from 475 to 4,978 (mean 3,020), and naturally reared fish have comprised an average of 46% of the run (C. Frederickson, Yakama Nation, personal communication, 2008).

The terminal fishery on coho is negligible, estimated at 1% by Yakama Nation biologists.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Naturalized Yakima coho are not part of any ESU.
- Population Designation: Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette arrives at a designation of Stabilizing.
- Current Viability Rating: Unknown
- Recovery Goal for Abundance: Not applicable because not listed
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity (from EDT): Productivity: 1.8; Capacity: 3,185

2.2 Current Hatchery Programs Affecting this Population

The current Yakima coho program is very likely to be changed in the near future (C. Frederickson, Yakama Nation, personal communication, 2008); therefore, both the current and the likely future programs are described below.

Under the current program, up to 700,000 Yakima stock smolts are acclimated and released from ponds on the Naches River at RM 9 and RM 39, and from ponds on the upper Yakima River at RM 160 and 180. The Naches and upper Yakima are not managed as separate populations. Adults used in the broodstock are collected in a manner that does not distinguish these population components.

The duration of the acclimation period is roughly February through May. Acclimation and release protocols are driven partly by an experimental assessment of the feasibility of reintroducing coho to the basin. The major objectives of the original study were to determine which watershed, upper Yakima or Naches, affords greater survival rates; whether survival differs as function of early (~May 7) or late (~May 28) releases; and whether survival rates differ between the progeny of Yakima-stock or broodstock from out-of-basin coho (either from the Little White Salmon Hatchery or Cascade Fish Hatchery). The Yakima stock are adult coho that are captured inside the Yakima River, specifically at the Prosser Dam right bank fish ladder. Under the current program, volitional releases occur beginning in April. The percent natural origin fish in the current Yakima stock was not known precisely until 2006. From 1999-2004 YN attempted to bring 100% NOR into the hatchery using non-CWT adults as brood. Unfortunately, the Prosser Right Bank Denil only passes an average of 40% of annual coho escapement, only a small proportion of which is NOR. Additionally, relying on CWTs is not the best way to obtain NOR/HOR differences due to both tag loss in either the juvenile or adult stages and the inaccuracy of CWT detectors in a metal and rebar reinforced concrete room. Using the 40% breakdown at the right bank denil, the remainder of adult escapement over Prosser Dam for NOR's and HOR's were extrapolated. Therefore, to increase accuracy on both juvenile out migration and adult escapement all coho have been adipose clipped since 2004. Each year the pNOB and pHOB is adjusted in season in accordance with escapement. The actual releases, prior to 2008, of Yakima stock coho have been considerably less than 500,000. In 2008, release of in-basin fish rose from an average of 10% from 2003-2007 to 27% in 2008. The in-basin releases

are projected to increase to 47% in 2009 with a maximum release of approximately half of the goal.

Most of the fish released under the original program were hatchery fish from the Little White Salmon (Willard) or Cascade hatcheries. Under the current program the primary source of coho comes from the Eagle Creek National Fish Hatchery. Approximately 500,000 of these hatchery smolts are released annually from the acclimation ponds in the upper Yakima and Naches. From 1999-2004 all coho released were CWT'd. Since 2004, all fish released have been 100% ad-clipped and 10,000 in-basin and 10,000 out-of-basin coho are PIT-tagged. PIT-tagging occurred in four ponds, each contained one group of 2,500 in-basin PIT-tags and 2,500 out-of-basin PIT-tags (for a total of 5,000 in each). Starting in 2005 extremely heavy predation in one acclimation pond reduced the acclimation comparisons down to only 4 ponds that contained the PIT-tags.

Under the future proposed program, 225,000 Yakima stock smolts would be released from both the upper Yakima and Naches river acclimation ponds (450,000 total). Whenever possible, 100% of the broodstock for these smolts would be natural origin fish (pNOB = 100%). This element of the program would be managed as an integrated harvest/conservation program. The overall goal of the in-basin broodstock program is to have 100% pNOB, however, under current collection conditions the goal is to first establish a Yakima line of hatchery fish. The pNOB approached 70% in 2004; however, releases of in-basin fish remained too low for significant returns. The YN has taken a stepped approach to keep out-of-basin returns separate from in-basin broodstock development. The next step will be to keep the hatchery YN returns out of the broodstock and move towards a full pNOB line of coho. Since 2005, broodstock has been approaching an even split, and in-basin releases have remained very low. Beginning in brood year 2006, the YN began using more YN fish, therefore increasing the total number of in-basin coho releases by 17% in 2008, and nearly 40% projected in 2009, with the full intention of moving to a 100%pNOB as soon as possible.

The future program would also include a segregated harvest element, with 500,000 smolts from Eagle being acclimated and released at the Prosser Hatchery (RM 47, just below Prosser Dam).

Like the current program, all fish from both groups would be ad-clipped or coded-wire tagged, and two groups of 2,500 coho, one group representing in-basin and one group representing out-of-basin stocks would be PIT-tagged and released into the active acclimation ponds. Assuming a 50% female sex ratio for returning Yakima and Naches river coho, and a mean fecundity of 2,900 eggs/female, 15% pre-spawning mortality and 85% egg to smolt survival, the project must collect approximately 430 Yakima NOR adults in order to produce 450,000 smolts. If fewer than these numbers of fish are available in-basin, they would be augmented with coho from lower Columbia River hatcheries. The plan assumes broodstock for the upper Yakima releases would be collected at Roza Dam and broodstock for the Naches releases would be collected either at Cowiche Dam on the lower Naches River or at Prosser Dam.

The results of the coho reintroduction study are summarized as follows (abstract from article submitted to American Fisheries Society North American Journal of Fisheries Management titled “*Evaluating the feasibility of reintroducing a coho salmon population in the Yakima River, Washington*”):

“Historical returns of coho salmon (*Oncorhynchus kisutch*) to the Yakima River Basin have been estimated to range from 45,000 to 100,000 fish annually. Due to many causes, coho salmon became extinct in the Yakima River by the early 1980s. In 1996 a project was initiated “to

determine the feasibility of reestablishing a naturally spawning coho population ... within the Yakima River Basin ...". The Yakima coho project explored whether successful adaptation and recolonization occurred when multi-generation hatchery fish were reintroduced to native habitats. The project also evaluated smolt survival for coho releases with different broodstock origins, and temporal and spatial distributions. The 2001-2003 releases from Yakima-return broodstock parents had significantly higher smolt-to-smolt survival indices than releases from out-of-basin broodstock parents. We found no significant difference between the smolt-to-smolt survival indices of smolts released in early versus late May. During 2000-2003, releases from the Naches subbasin (lower in the watershed) had higher smolt-to-smolt survival indices than releases from the Upper Yakima River. We also compared relative smolt-to-adult survival between Yakima River coho and spring Chinook (*O. tshawytscha*) since both are stream-type (yearling migrant) salmon. For seven juvenile migration years from 1997-2003, the mean smolt-to-adult survival index for returns from hatchery-derived coho production was estimated to be 3.7%, approximately 70% of the estimated mean survival index for wild/natural spring Chinook (5.3%) in the Yakima Basin over the same period. Finally, we documented that substantial natural production of coho is occurring, and smolt-to-adult survival for naturally produced coho appears to be at least 3.5 times the survival for returns from known hatchery releases. While the project demonstrated some success in reestablishing a natural spawning population of coho from an out-of-basin hatchery population, further development of locally adapted natural broodstock and establishing naturally producing populations in tributaries are likely necessary to sustain long-term, natural production."

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program – from AHA summary: 1,838 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 5,391 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.3. Average abundance of natural-origin spawners (NOS) would decrease from 1,043 to 518. Harvest contribution of the natural and hatchery populations would go from 7,940 to 232.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

For management purposes, the entire Yakima subbasin is treated as a single stock. There is a reintroduction program in the upper river and a segregated harvest program in the lower river. The reintroduction program uses a mix of natural and hatchery returns collected at Prosser. The lower river segregated program currently uses out-of-basin broodstock.

All fish are currently adipose fin-clipped, but this is a practice that will cease for in-basin coho in an attempt to improve survival by reducing sport harvest in selective fisheries. In-basin coho will be coded wire tagged and out-of-basin coho will continue to be adipose clipped under the Mitchell Act.

Recommendations

The reintroduction programs should continue to move aggressively toward developing local broodstocks within the basin. Broodstock for fish released in the upper Yakima should be

collected at Roza. Broodstock for fish released in the Naches should be collected from the Naches. We recommend that these fish should be coded-wire tagged but not adipose fin-clipped.

The segregated harvest program in the lower river should also be based on a local broodstock from hatchery returns. These fish should have external marks and a portion coded-wire tagged to maximize harvest so that broodstock separation can be achieved and straying into the natural population can be evaluated.

In-basin facilities for incubation and rearing should be developed. In the interim, local broodstock may need to be incubated and reared out-of-basin.

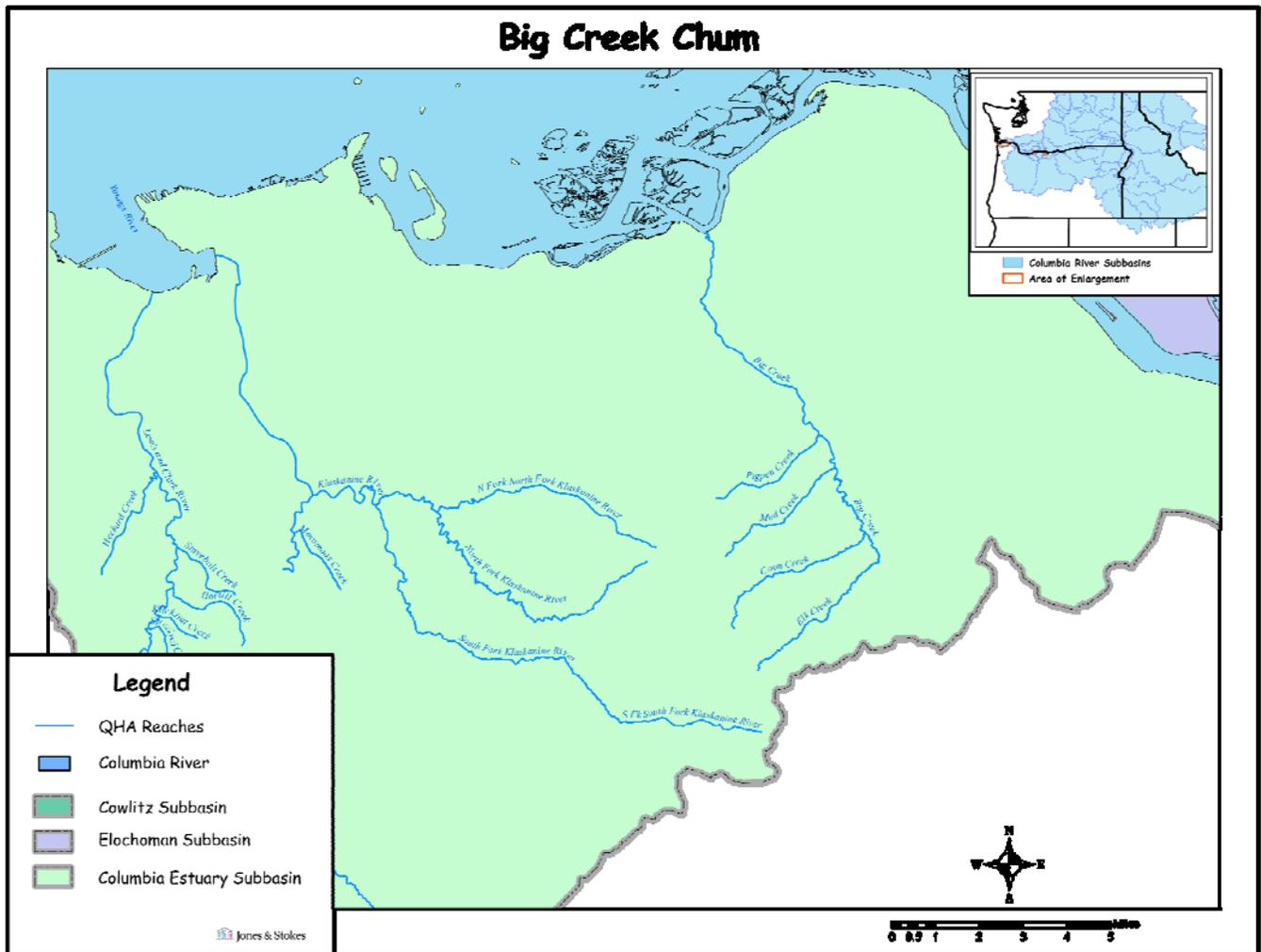
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Yakima River Coho. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 452.1 | 25% | 0% | 76% | 0.21 | 1043 | 0.6 | 4,324 | 286 |
| | Seg Harv | 427.9 | 0% | | | | | | 3,616 | 0 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 518 | 1.3 | 232 | - |
| HSRG Solution | Int Both | 452.1 | 30% | 0% | 68% | 0.53 | 709 | 0.9 | 4,276 | 636 |
| | Seg Harv | 427.9 | 98% | | | | | | 3,616 | 1,893 |
| HSRG Solution w/ Improve Habitat | Int Both | 452.1 | 30% | 0% | 63% | 0.54 | 872 | 1.0 | 4,349 | 636 |
| | Seg Harv | 427.9 | 98% | | | | | | 3,616 | 1,893 |

Hatchery Scientific Review Group Review and Recommendations

Big Creek Chum Population and Related Hatchery Programs

January 31, 2009



1 Big Creek Chum

Big Creek chum salmon are one of 16 populations historically present in this ESU. At one time, over one million chum salmon returned to the lower Columbia River (McElhany 2005), while today, few are observed. Run sizes range from a few hundred to a few thousand adults. Most chum salmon in the Lower Columbia River are observed in the Grays River and a few locations further upstream. Chum salmon in Oregon are few. Counts at the fish weir on Big Creek vary from 0 adults to over 150 adults in 2006. Chum salmon return to Big Creek at the same time as hatchery coho and are likely experiencing high incidental mortality in the Young's Bay terminal gill-net fisheries.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: This population is listed as threatened and is part of the Columbia River Chum Salmon ESU.
- Population Description: Contributing
- Current Viability Rating: NA, with a goal of Low; extinction risk is very high for this population (LCSR&SP 2004).
- Recovery Goal for Abundance: NA
- Productivity Improvement Expectation: Not known
- Habitat Productivity and Capacity: Unknown, but for modeling purposes the following assumptions were made: Productivity 1.5; Capacity 100
- Populations Affected by this Hatchery Population Include: NA
- Hatchery Populations of the Same Species that Affect this Population: Hatchery-chum salmon released from the Grays-Chinook River program.

2.2 Current Hatchery Programs Affecting this Population

No chum hatchery program currently operates in Big Creek; however, chum salmon from other programs may stray into Big Creek. Under the current scenario, pHOS is estimated at 55% (37 fish) even though no hatchery coho are released into Big Creek. No information is available on annual run size. Hatchery personnel report a few chum at the hatchery fish weir.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program – None
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – 37 adults

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning

population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.7 to 1.5. Average abundance of natural-origin spawners (NOS) would increase from 29 to 33. Incidental harvest of the natural and hatchery populations remained unchanged at 1 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Chum salmon have been observed in Big Creek by the hatchery personnel. This population is designated a Contributing population.

Recommendations

The HSRG recommends that managers monitor chum salmon abundance in Big Creek. Consider this population as a candidate for a small conservation hatchery program.

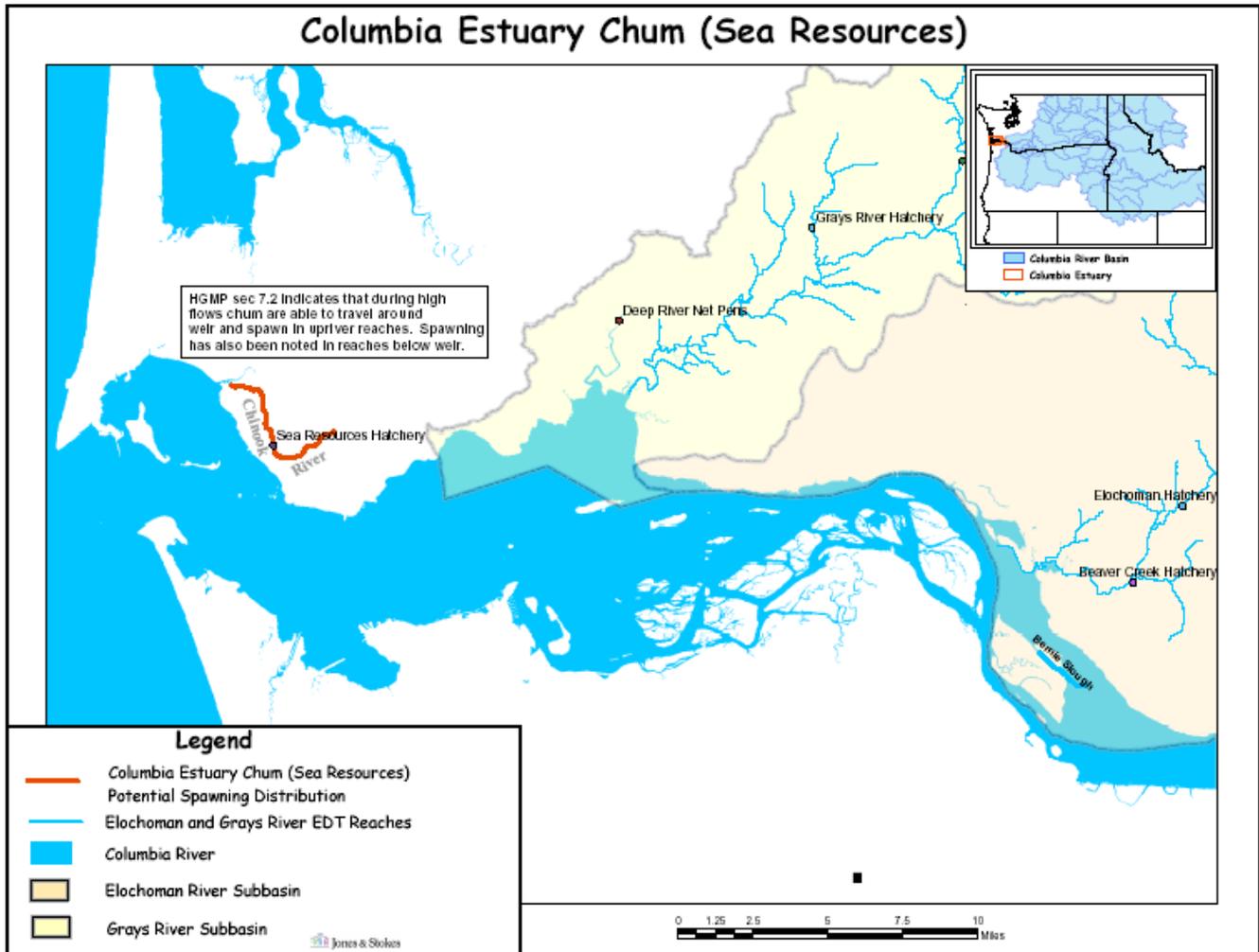
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Big Creek Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 55% | 0.00 | 29 | 0.7 | 1 | - |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 33 | 1.5 | 1 | - |
| | | | | | | | | | | |
| HSRG Solution | None None | - | 0% | 0% | 52% | 0.00 | 26 | 0.7 | 1 | - |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 48% | 0.00 | 30 | 0.8 | 1 | - |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Columbia Estuary Chinook River Chum Population and Related Hatchery Programs

January 31, 2009



1 Chinook River Chum

Columbia River chum salmon were listed as threatened in 1999. A chum supplementation program has been operated in the Chinook River, site of the program currently being considered, since 1968. Chum populations used in the supplementation program over the years have been derived from various sources, including Bear Creek, Naselle River, and Nemah River. More recently, the chums used have been from the nearby Grays River. Still more recently, chum salmon returning to the Chinook River have served as the source of eggs for the program.

Currently the program has been suspended because of a lack of funds, and Sea Resources is now focusing its efforts on improving fish habitat in the river. Currently, fewer than 300 chum return to the Chinook River annually.

2 Current Conditions

2.1 Current Population Status and Goals

- **ESA Status:** This population is listed as threatened and is part of the Columbia River Chum Salmon ESU. The ESU includes the Chinook River population.
- **Population Description:** Taken together with the Grays River chum population, this population is described as Primary.
- **Current Viability Rating:** Low+, with a goal of High+. Chinook River chum salmon are considered together with the adjacent Grays River population as a Primary component of the ESU (LCSR&SP 2004).
- **Recovery Goal for Abundance:** 6,000 for both the Grays and Chinook components.
- **Productivity Improvement Expectation:** The potential productivity value for the Chinook River chum population is 2.78 (LCSR&SP 2004).
- **Habitat Productivity and Capacity:** Unknown. For modeling purposes, the following was assumed: Productivity 2.5; Capacity 450.
- **Populations Affected by this Hatchery Population:** NA
- **Hatchery Populations of the Same Species that Affect this Population:** Hatchery-chum salmon released from the Grays River and Duncan Creek programs could possibly affect this population.

2.2 Current Hatchery Programs Affecting this Population

No chum salmon hatchery program currently operates in the Chinook River out of the Sea Resources Fish Hatchery. Straying of hatchery-produced chum into the Chinook River is thought to be low.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program – None
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – 0 adults

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain unchanged at 2.4 returns per spawner. Average abundance of natural-origin spawners (NOS) would also remain unchanged at 287. Incidental harvest of the natural and hatchery populations stay at 6 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Funding has been discontinued for this program. The current focus is on improving fish habitat in the river.

Recommendations

The HSRG recommends that managers continue the emphasis on habitat restoration and education with a small conservation program (60,000 release) using a 100% natural-origin broodstock collected from the Chinook and Grays rivers. All hatchery-origin fish would need to be marked and the proportion of hatchery fish on the spawning grounds monitored. Allow all returning hatchery fish to spawn naturally.

This, like all chum conservation programs in the lower Columbia, should include a “sunset” clause that would suspend the hatchery program after three generations, unless evidence suggests suspending releases earlier or extending the program beyond three generations would benefit the population.

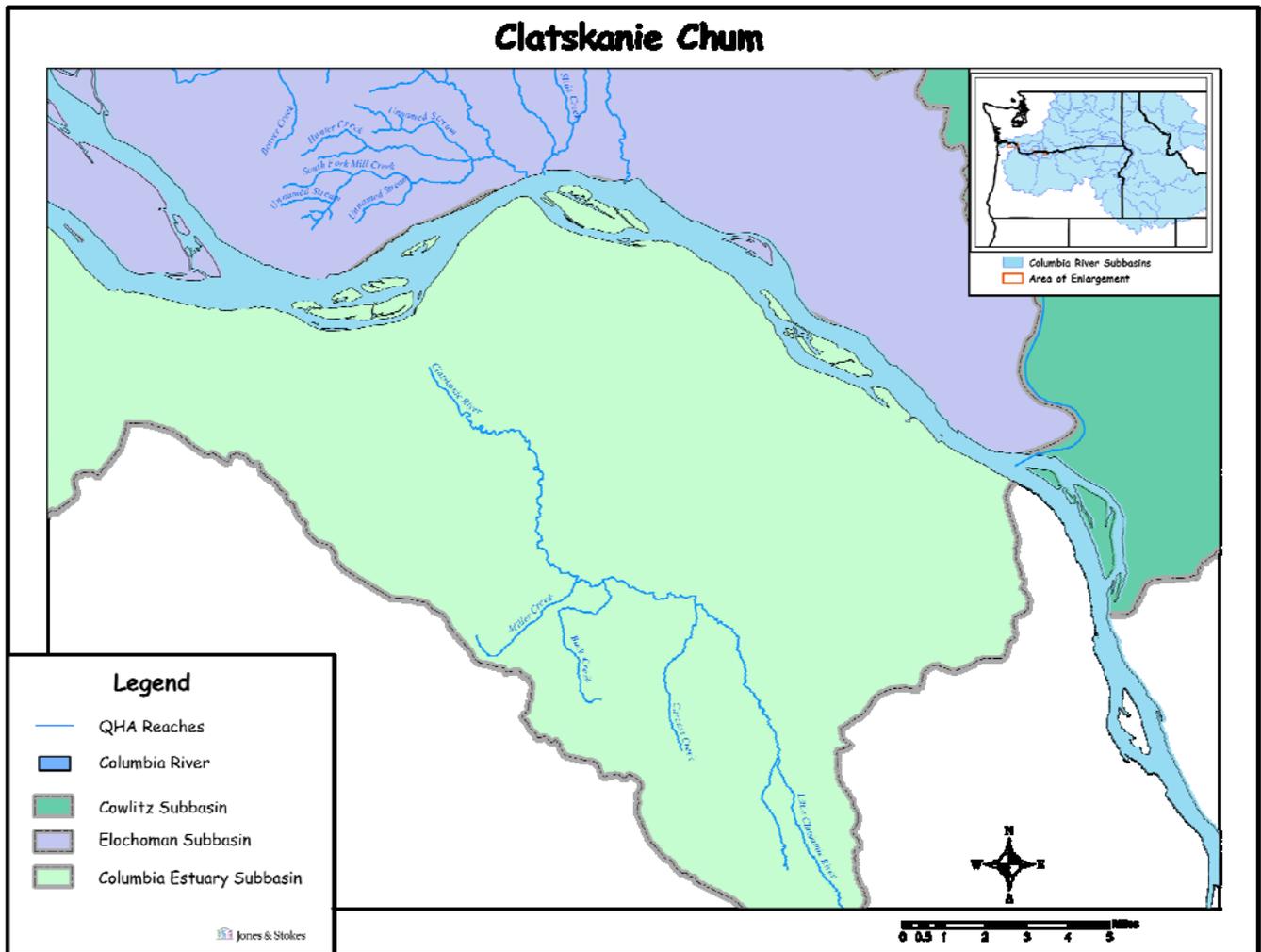
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Chinook River Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 0% | 0.00 | 287 | 2.4 | 6 | - |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 287 | 2.4 | 6 | - |
| HSRG Solution | Int Cons | 64.0 | 0% | 0% | 68% | 0.60 | 360 | 2.4 | 23 | 1 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 64.0 | 0% | 0% | 65% | 0.61 | 404 | 2.6 | 24 | 1 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Clatskanie Creek Chum Population and Related Hatchery Programs

January 31, 2009



1 Clatskanie Creek Chum Salmon

Clatskanie Creek chum salmon are one of 16 populations historically present in this ESU. This population also includes Plympton and Beaver creeks (Meyers et al. 2006). At one time over one million chum salmon returned to the lower Columbia River (McElhany 2005); currently few chum are observed. Run sizes range from a few hundred to a few thousand adults. Most chum salmon in the Lower Columbia River are observed in the Grays River and a few locations further upstream; few are observed in Oregon. No abundance information is available for Clatskanie Creek chum. Chum counts at the fish weir on Big Creek vary from 0 adults to over 150 adults in 2006. Chum salmon are returning to Clatskanie Creek at the same time as hatchery coho and are likely experiencing high incidental mortality in the Youngs Bay gill-net fisheries.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: This population is listed as threatened and is part of the Columbia River Chum Salmon ESU.
- Population Description: Contributing
- Current Viability Rating: NA, with a goal of Medium; extinction risk is very high for this population (LCSR&SP 2004).
- Recovery Goal for Abundance: NA
- Productivity Improvement Expectation: Not known
- Habitat Productivity and Capacity: Unknown. For modeling purposes, the following assumptions were used: Productivity 1.5; Capacity 100
- Populations Affected by this Hatchery Population: NA
- Hatchery Populations of the Same Species that Affect this Population: Hatchery chum salmon released from the Grays-Chinook River program.

2.2 Current Hatchery Programs Affecting this Population

No chum hatchery program currently operates in Clatskanie Creek; however, chum salmon from other programs may stray into this stream. Under the current scenario, pHOS is estimated at 55% (37 fish).

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program – None
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – 37 adults

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning

population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.7 to 1.5. Average abundance of natural-origin spawners (NOS) would increase from 29 to 33. Incidental harvest of the natural and hatchery populations remained unchanged at 1 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is consistent with the criteria for designation as a Contributing population.

Recommendations

The HSRG recommends that managers monitor chum salmon abundance in Clatskanie Creek. Consider this a likely population for a small conservation hatchery program in Oregon as an alternative to a program in the Klaskanine River.

Implement a low cost conservation program using local natural origin broodstock as available and broodstock from natural origin returns from the Grays River as necessary. All hatchery origin fish would need to be marked and the proportion of hatchery fish on the spawning grounds monitored. Monitor the contribution of hatchery strays in the spawning escapement and natural production.

This, like all chum conservation programs in the lower Columbia, should include a “sunset” clause that would suspend the hatchery program after three generations, unless evidence suggests suspending releases earlier or extending the program beyond three generations would benefit the population.

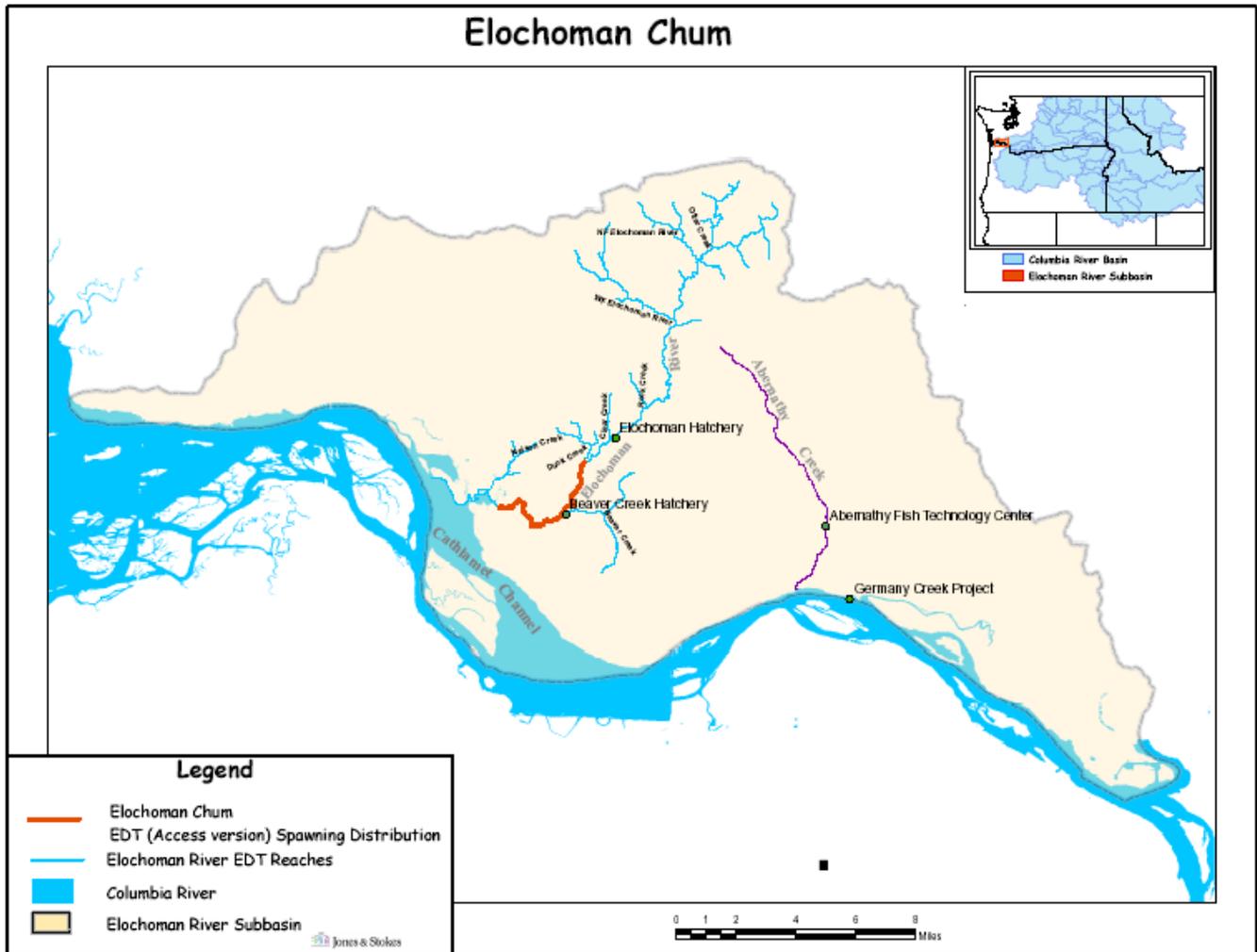
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Clatskanie Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 55% | 0.00 | 29 | 0.7 | 1 | - |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | | 1.00 | 33 | 1.5 | 1 | - |
| HSRG Solution | None | - | 0% | 0% | 52% | 0.00 | 26 | 0.7 | 1 | - |
| | None | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None | - | 0% | 0% | 48% | 0.00 | 30 | 0.8 | 1 | - |
| | None | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Elochoman River Chum Population and Related Hatchery Programs

January 31, 2009



1 Elochoman River Chum

This is one of 16 populations historically present in this ESU (Meyers et al. 2006). At one time over one million chum salmon returned to the lower Columbia River (McElhany 2005); currently few chum are observed. Run sizes range from a few hundred to a few thousand adults. Most chum salmon in the Lower Columbia River are observed in the Grays River and a few locations further upstream. As recently as the 1950s, between 10,000 and 15,000 chum salmon returned to the Elochoman River. Current returns have varied between 30 and nearly 300 adults. Natural spawning occurs in the lower mainstem between tidewater and the Elochoman Hatchery and in Skamakowa Creek upstream of tidewater. An independent tributary just downstream of Skamakowa Creek, Jim Crow Creek, is also an important spawning area for this population.

2 Current Conditions

2.1 Current Population Status and Goals

- ESA Status: This population is listed as threatened and is part of the Columbia River Chum Salmon ESU.
- Population Description: Elochoman River chum salmon are described as a Primary population (LCSR&SP 2004).
- Current Viability Rating: Low, with a goal of High
- Recovery Goal for Abundance: 1,100 naturally spawning fish
- Productivity Improvement Expectation: The potential productivity value for this population is 2.48 (LCSR&SP 2004).
- Habitat Productivity and Capacity (from EDT): Productivity 2.0; Capacity 3,260
- Populations Affected by this Hatchery Population: None
- Hatchery Populations of the Same Species that Affect this Population: Hatchery chum salmon released from Grays River and Duncan Creek programs could possibly affect this population.

2.2 Current Hatchery Programs Affecting this Population

No chum salmon hatchery program currently operates in the Elochoman River out of the Elochoman Fish Hatchery. Chum salmon were released from the Elochoman Hatchery from 1958 to 1983. Annual release averaged 340,000 fry over 20 years. Chum fry were also released from Skamakowa Creek from 1978 to 1983, with an average annual release of 88,000 fry.

Straying of hatchery-produced chum into the Elochoman River is thought to be low. The effective p_{HOS} is estimated to be 3%.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program – None
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – 58 adults

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain unchanged at 1.9 returns per spawner. Average abundance of natural-origin spawners (NOS) would also remain unchanged at approximately 1,750 adults. Incidental harvest of the natural and hatchery populations remained unchanged at 36 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated a Primary population.

Recommendations

Monitor chum salmon abundance in Elochoman River. Consider this as a likely population for a small conservation hatchery program.

Implement a low cost conservation program (130,000 smolt release) using local natural-origin broodstock as available and broodstock from natural origin returns from the Grays River as necessary. All hatchery-origin fish would need to be marked and the proportion of hatchery fish on the spawning grounds monitored. Monitor the contribution of hatchery strays in the spawning escapement and natural production.

This, like all chum conservation programs in the lower Columbia, should include a “sunset” clause that would suspend the hatchery program after three generations, unless evidence suggests suspending releases earlier or extending the program beyond three generations would benefit the population.

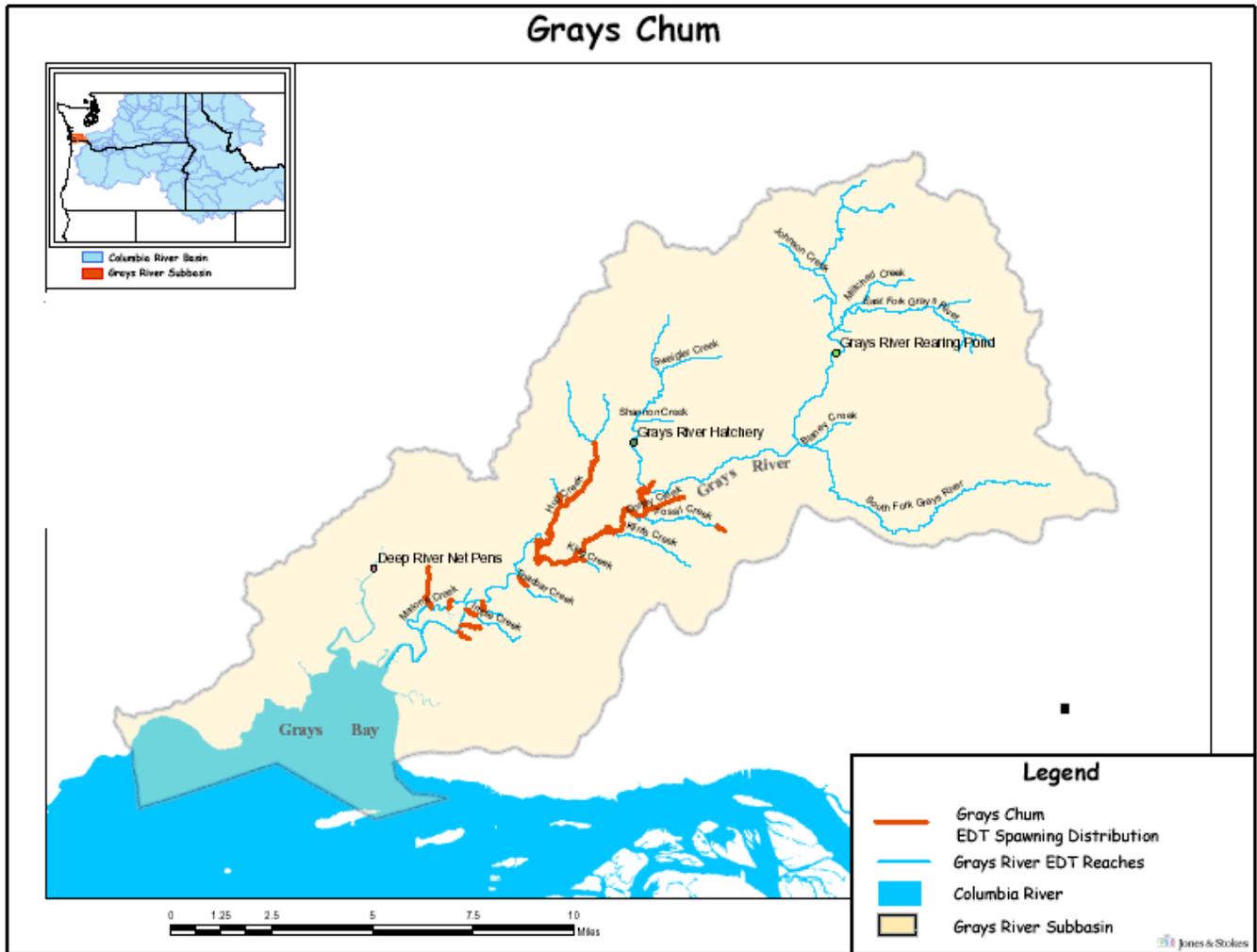
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Elochoman River Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 3% | 0.00 | 1,744 | 1.9 | 36 | - |
| | None | | | | | | | | | |
| No Hatchery | Int Cons | - | 0% | 0% | 0% | 1.00 | 1,750 | 1.9 | 36 | - |
| HSRG Solution | Int Cons | 182.0 | 0% | 0% | 45% | 0.69 | 2,414 | 1.9 | 93 | - |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 182.0 | 0% | 0% | 42% | 0.70 | 2,726 | 2.1 | 99 | - |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Grays River Chum Population and Related Hatchery Programs

January 31, 2009



1 Grays River Chum

The historical Grays/Chinook River adult population is estimated to have ranged from 8,000 to 14,000 fish. Current returns range from 50 to 10,000 fish. Spawning occurs in the lower mainstem, West Fork, Crazy Johnson Creek, and in Gorley Creek. Current returns are predominately from natural production except for a minor contribution from an enhancement program of 200,000 fry release at Grays River Hatchery. Peak spawning occurs in late November-early December. Juveniles emerge in the early spring and migrate to the Columbia after a short rearing period (Lower Columbia Salmon Recovery & Subbasin Plan [LCSR&SP] 2004).

This population has remained stable at low to moderate levels over the last 50 years. The most recent year's returns have been relatively large. Enhancement programs have been ongoing in the Grays Basin. The population was targeted for High+ viability to address ESU recovery risk and to meet strata recovery criteria (LCSR&SP 2004).

2 Current Conditions

2.1 Current Population Status and Goals

- **ESA Status:** This population is listed as threatened. The natural and hatchery populations of Grays River chum salmon are included in the Columbia River Chum ESU.
- **Population Description:** The Grays River chum population is designated as a primary population (LCSR&SP 2004).
- **Current Viability Rating:** Low+ with a goal of High+
- **Recovery Goal for Abundance:** 6,000
- **Productivity Improvement Expectation:** The recovery plan (LCSR&SP 2004) provides a productivity improvement expectation of 4.75 R/S and a capacity of 2,981 adults.
- **Habitat Productivity and Capacity (from EDT):** Productivity 2.5; Capacity 1,569
- **Populations Affected by this Hatchery Population Include:** Natural chum populations in nearby rivers
- **Hatchery Populations of the Same Species that may Affect this Natural Population:** There are no other hatchery populations of chum salmon in the region that would be likely to affect this population (e.g., through straying).

2.2 Current Hatchery Programs Affecting This Population

The overall goal of the Grays River chum hatchery program is to aid recovery of the Columbia River chum salmon ESU through supplementation and reintroduction strategies (HGMP 2004). The program uses local-origin broodstock. Adults are captured from volitional returns to the fish ladder V-trap located at the downstream end of the Grays River Hatchery compound, where incubation and rearing occur. The current hatchery program, which began in 1998, is described as an integrated conservation program. There is no directed harvest. The program size is 156 broodstock and 200,000 smolts. It is not possible to estimate PNI since hatchery-origin fish are not currently marked externally, although all hatchery fish have otoliths thermally marked (HGMP 2004). Average hatchery returns substantially exceed broodstock needs, with a surplus of 434 fish.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program – 1,593
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – 0 adults

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.2 to 2.4 returns per spawner. Average abundance of natural-origin spawners (NOS) would also decrease from 1,300 adults to 1,000 adults. Incidental harvest of the natural and hatchery populations would remain the same at 71 adults.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is both a Primary and a core population. There is a chum hatchery program here that releases 200,000 smolts. Broodstock from Grays River could be used as broodstock to start populations elsewhere. If a best integrated program is adopted, it would still meet the criteria of a Primary population, although releases would need to be reduced by 50%.

Recommendations

Hatchery-origin fish need to be marked and the proportion of hatchery fish on the spawning grounds monitored. Allow all returning hatchery fish to spawn naturally. Consider using the Grays River Hatchery as a source hatchery for chum salmon conservation programs in the Chinook, Mill-Abernathy-Germany and/or Elochoman rivers.

This, like all chum conservation programs in the lower Columbia, should include a “sunset” clause that would suspend the hatchery program after three generations, unless evidence suggests suspending releases earlier or extending the program beyond three generations would benefit the population.

The program size provides broodstock for conservation programs in other watersheds.

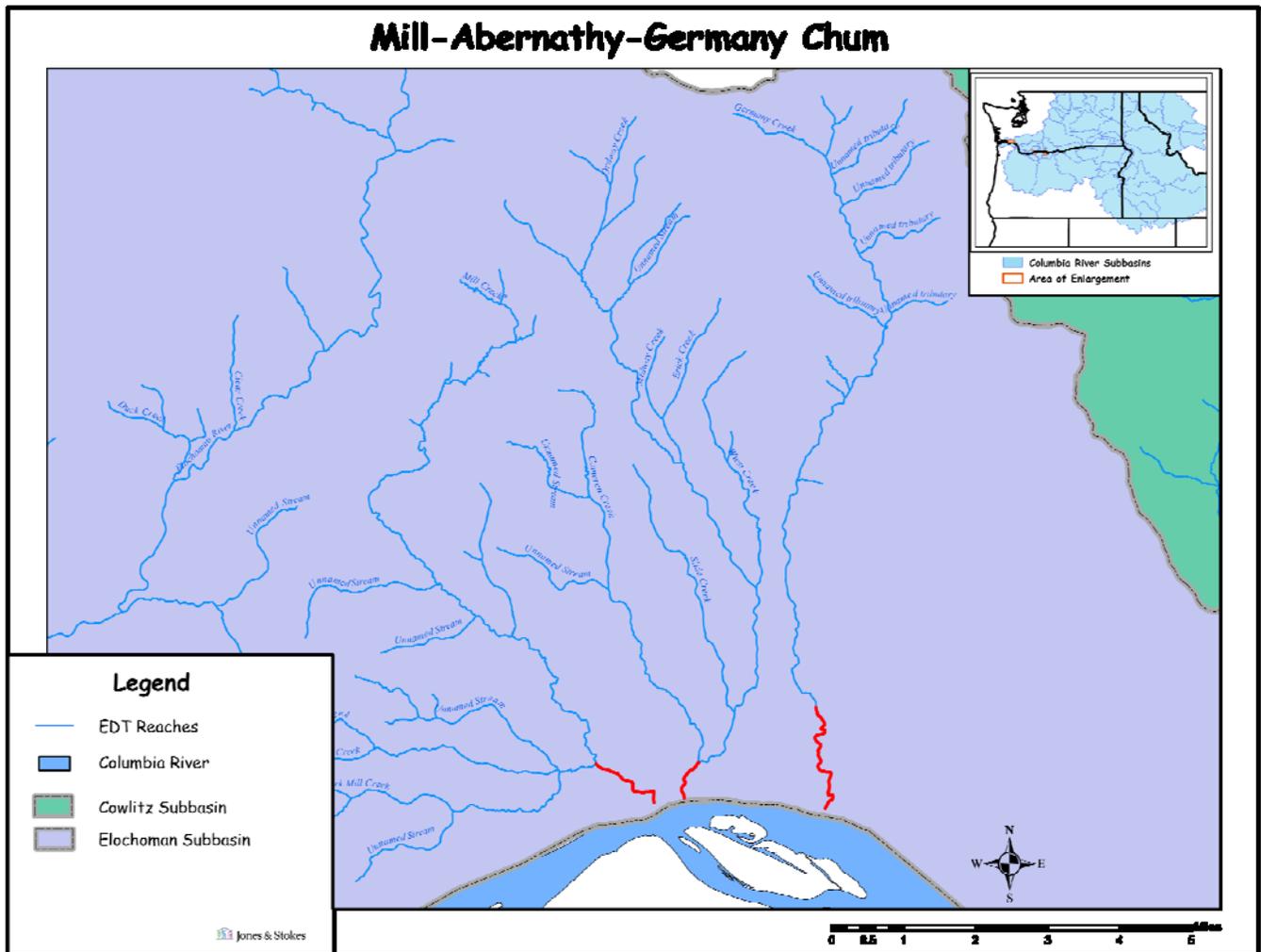
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Grays-Chinook River Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 200.1 | 27% | 0% | 54% | 0.00 | 1,291 | 2.2 | 71 | 434 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,001 | 2.4 | 71 | - |
| HSRG Solution | Int Cons | 115.3 | 0% | 0% | 52% | 0.66 | 1,245 | 2.4 | 53 | - |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 115.3 | 0% | 0% | 49% | 0.67 | 1,396 | 2.6 | 56 | - |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Mill, Abernathy and Germany Creek Chum Population and Related Hatchery Programs

January 31, 2009



1 Mill, Abernathy, and Germany Creek Chum Salmon

This is one of 16 populations historically present in this ESU (Meyers et al. 2006). At one time over one million chum salmon returned to the lower Columbia River (McElhany 2005); currently few are observed. Run sizes range from a few hundred to a few thousand adults. Most chum salmon in the Lower Columbia River are observed in the Grays River and a few locations further upstream. Historical chum salmon abundance ranged from 6,500 to 40,000 fish based on available habitat and habitat modeling. Currently abundance of natural spawners in Mill, Abernathy and Germany creeks has varied from 1 to over 400 adults from 2001 to 2007. Most spawning is in the lower portions of the streams, with recent spawning primarily concentrated in Abernathy and Germany creeks.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: This population is listed as threatened and is part of the Columbia River Chum Salmon ESU.
- Population Description: Primary
- Current Viability Rating: Very Low, with a goal of High; extinction risk is very high for this population (LCSR&SP 2004).
- Recovery Goal for Abundance: 1,100
- Productivity Improvement Expectation: Not known
- Habitat Productivity and Capacity (EDT based): Productivity 1.9; Capacity 1,300
- Populations Affected by this Hatchery Population: NA
- Hatchery Populations of the Same Species that Affect this Population: Hatchery chum salmon released from the Grays-Chinook River program.

2.2 Current Hatchery Programs Affecting this Population

No chum hatchery program currently operates in these creeks; however, chum salmon from other programs may stray into this stream. Under the current scenario, pHOS is estimated at 1% (9 fish).

Hatchery fry were released into Germany Creek in 1982 and 1983 and from 1958 to 1991 in Abernathy Creek. Annual releases in Abernathy Creek averaged 450,000 fry.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program – None
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – 9 adults

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For

populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase slightly from 1.8 to 1.9 returns per spawner. Average abundance of natural-origin spawners (NOS) would also remain the same at approximately 630 adults. Incidental harvest of the natural and hatchery populations remained unchanged at 13 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated a Primary population that appears to have habitat potential to be productive and abundant. There are no hatchery releases in these streams.

Recommendations

The HSRG recommends that managers monitor abundance of natural-origin chum.

Table 1. Results of HSRG analysis of current conditions and HSRG solution for Mill, Abernathy and Germany Creek Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 629 | 1.8 | 13 | - |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 629 | 1.9 | 13 | - |
| HSRG Solution | Int Cons | 61.4 | 0% | 0% | 45% | 0.69 | 906 | 1.8 | 33 | - |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 61.4 | 0% | 0% | 42% | 0.70 | 1,023 | 2.0 | 36 | - |
| | | | | | | | | | | |

1 Youngs Bay Tributaries Chum Salmon

Youngs Bay Tributaries chum salmon are one of 16 populations historically present in this ESU. This population includes the Lewis and Clark River, Youngs River, Wallooskee River and Klaskanine River (Meyers et al. 2006). At one time over one million chum salmon returned to the lower Columbia River (McElhany 2005); currently few are observed. Run sizes range from a few hundred to a few thousand adults. Most chum salmon in the Lower Columbia River are observed in the Grays River and a few locations further upstream. Few are observed in Oregon. No abundance information is available for Youngs Bay Tributaries chum. Chum counts at the fish weir on Big Creek vary from 0 adults to over 150 adults in 2006. Chum salmon are returning to Youngs Bay at the same time as hatchery coho and are likely experiencing high incidental mortality in the terminal gill-net fisheries.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: This population is listed as threatened and is part of the Columbia River Chum Salmon ESU.
- Population Description: Primary
- Current Viability Rating: NA, with a goal of High; extinction risk is very high for this population (LCSR&SP 2004).
- Recovery Goal for Abundance: NA
- Productivity Improvement Expectation: Not known
- Habitat Productivity and Capacity: Unknown. For modeling purposes, the following assumptions were made: Productivity- 1.5; Capacity- 1,000 .
- Populations Affected by this Hatchery Population: NA
- Hatchery Populations of the Same Species that Affect this Population: Hatchery chum salmon released from the Grays-Chinook River program

2.2 Current Hatchery Programs Affecting this Population

No chum hatchery program currently operates in Youngs Bay; however, chum salmon from other programs may stray into the tributaries of Youngs Bay. Under the current scenario, pHOS is estimated at 9% (37 fish).

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program – None
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – 37 adults

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of

effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.4 to 1.5. Average abundance of natural-origin spawners (NOS) would decrease from 354 to 327. Incidental harvest of the natural and hatchery populations remained unchanged at 7 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated a Primary population.

Recommendations

Monitor chum salmon abundance in tributaries of Youngs Bay (Klaskanine, Youngs and/or Lewis & Clark rivers). Consider this population as a likely population for a small conservation hatchery program in Oregon.

Implement a low cost conservation program (100,000 smolt release) using local natural origin broodstock as available and broodstock from natural origin returns from the Grays River as necessary. All hatchery-origin fish would need to be marked and the proportion of hatchery fish on the spawning grounds monitored. Monitor the contribution of hatchery strays in the spawning escapement and natural production.

This, like all chum conservation programs in the lower Columbia, should include a “sunset” clause that would suspend the hatchery program after three generations, unless evidence suggests suspending releases earlier or extending the program beyond three generations would benefit the population.

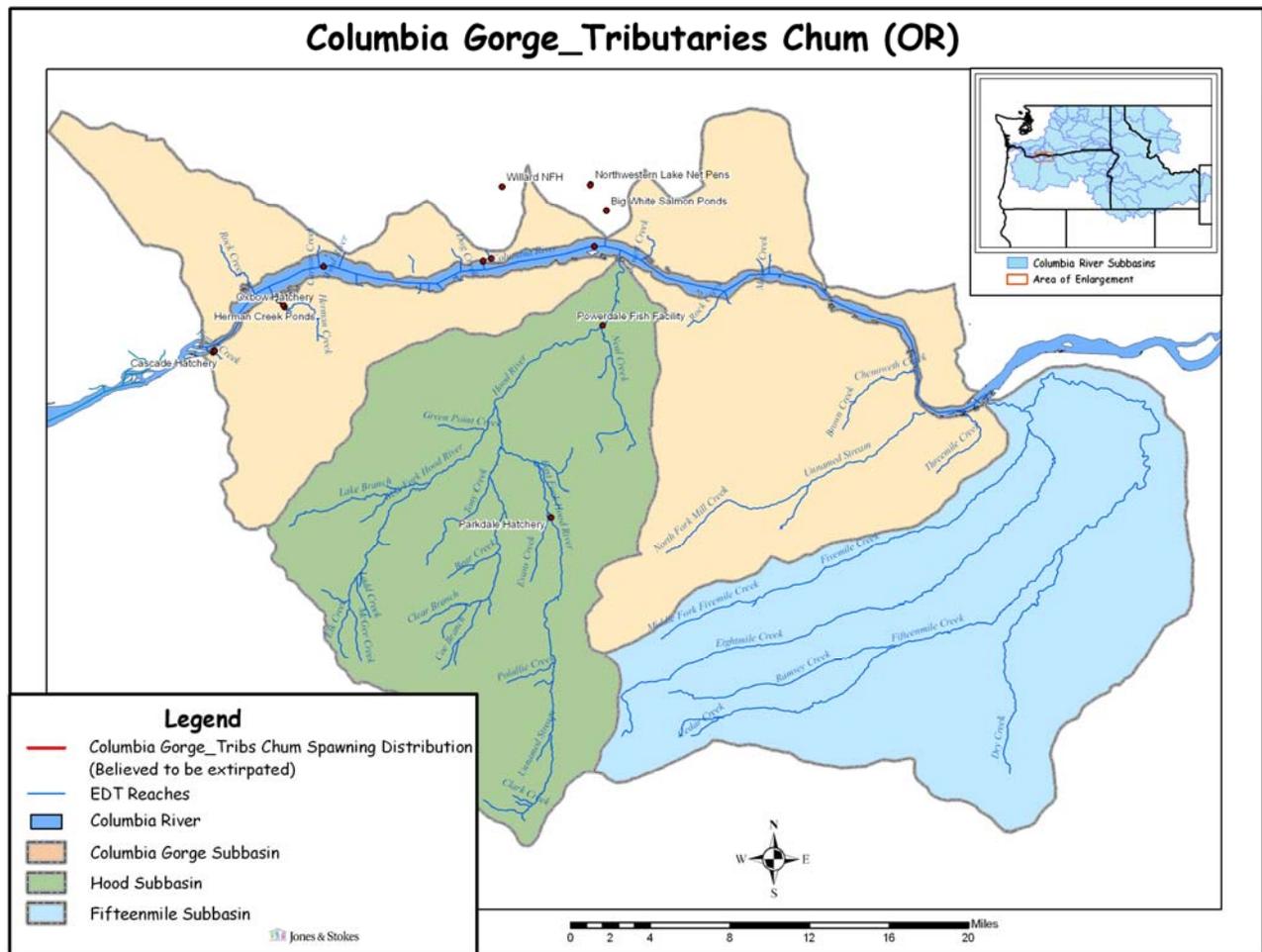
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Youngs Bay Tributaries Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 9% | 0.00 | 354 | 1.4 | 7 | - |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 327 | 1.5 | 7 | - |
| | None | | | | | | | | | |
| HSRG Solution | Int Cons | 96.1 | 0% | 0% | 61% | 0.62 | 685 | 1.4 | 37 | - |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 96.1 | 0% | 0% | 58% | 0.63 | 773 | 1.6 | 39 | - |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Columbia Gorge Tributaries Chum (Lower Gorge) Population and Related Hatchery Programs

January 31, 2009



1 Columbia Gorge Tributaries Chum (Lower Gorge)

Chum salmon are believed to be extirpated from the Columbia Gorge Subbasin (Gorge Subbasin Plan 2004). Their historic range may contribute importantly to the species' spatial structure and diversity. They spawn in low gradient streams or seeps that may have been inundated or affected by reservoir operations. In most years, chum are observed passing upstream of Bonneville Dam. It is unknown if these are adults returning to spawning areas upstream and making a self-sustaining run, or are strays from the lower river. This population includes tributaries on both sides of the river, from Bonneville Dam to the Hood River. It is assumed that the Bonneville Pool has flooded much of the historic spawning habitat for chum.

Based on Wind River spawning chum, spawning may occur from late November through December. Observations of adult spawners in the Bonneville Dam tailrace indicate peak spawning occurs in mid-November to early December (Gorge Subbasin Plan 2004).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Chum spawning in the minor tributaries to the Lower Columbia Gorge are part of the Columbia Chum ESU which was listed as Threatened under the ESA in 1999.
- Population Description: The Lower Gorge Tributaries Chum population is designated as a Primary population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes current viability as Very Low with a viability goal of Medium.
- Recovery Goal for Abundance: 2,800
- Productivity Improvement Expectation: NA
- Habitat Productivity and Capacity: Unknown. For modeling purposes, the following was assumed: Productivity- 1.5; Capacity- 100.

2.2 Current Hatchery Programs Affecting this Population

Straying of hatchery-produced chum to this population is thought to be negligible.

- Hatchery strays from in-basin integrated hatchery program – None
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – None

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less

than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain unchanged at 1.5 returns per spawner. Average abundance of natural-origin spawners (NOS) remained unchanged at 33 adults. Incidental harvest of the natural and hatchery populations remained unchanged at 1 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is designated a Primary population with an existing hatchery program (100,000 release).

Recommendations

The HSRG recommends continuation of the hatchery program using local natural-origin broodstock as available and broodstock from natural origin returns from the Lewis River as necessary until the recovery goals are achieved and the population becomes self-sustaining. Fed fry should be adipose fin-clipped to distinguish HOR from NOR adults. This would allow collection of 100% NOR adults for broodstock to increase the PNI above 0.67. Monitor contribution of hatchery strays in spawning escapement and natural production.

This, like all chum conservation programs in the lower Columbia, should include a "sunset" clause that would suspend the hatchery program after three generations, unless evidence suggest suspending releases earlier or extending the program beyond three generations.

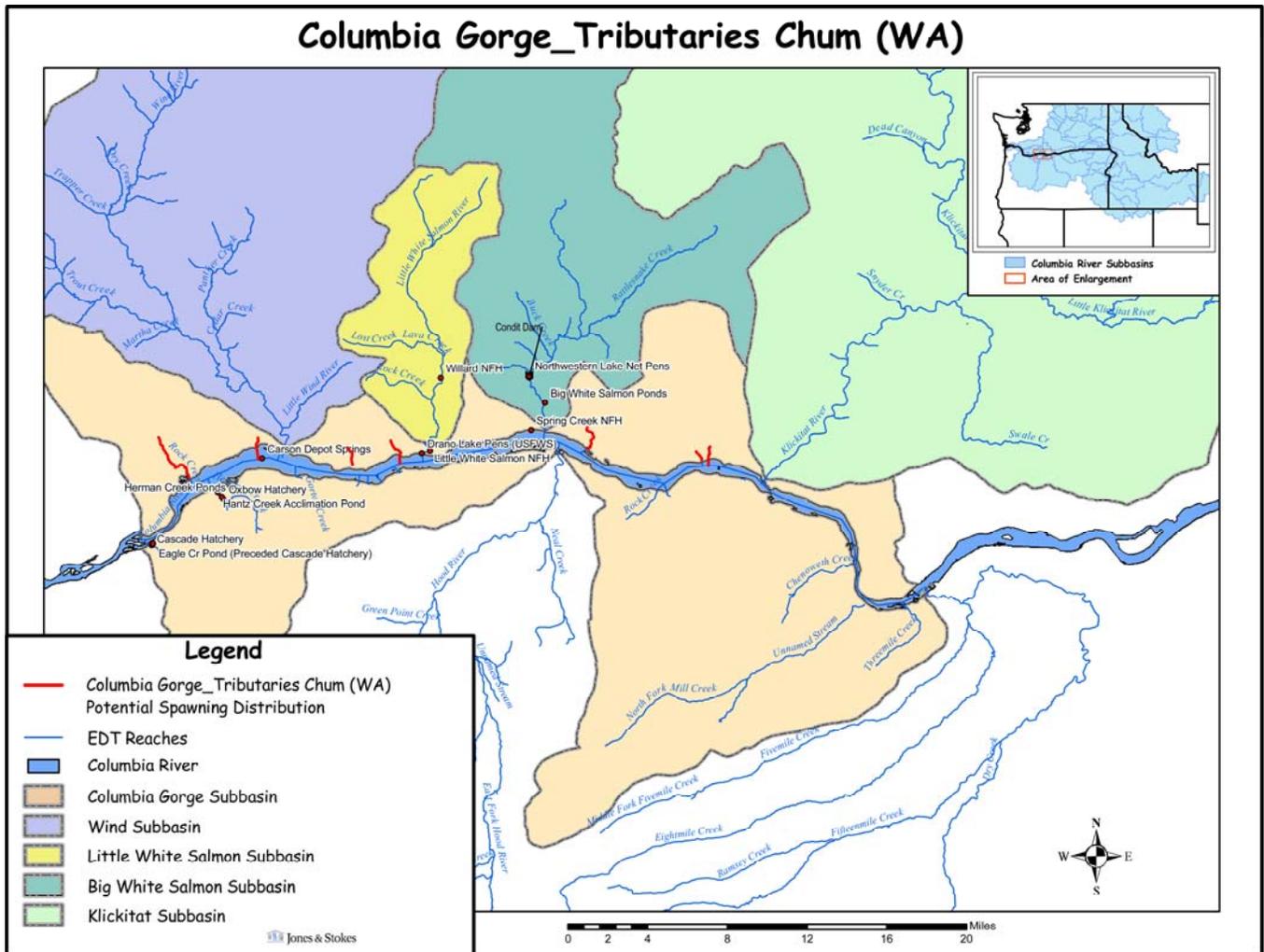
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Columbia Gorge Lower Tributaries Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 0% | 1.00 | 33 | 1.5 | 1 | - |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 33 | 1.5 | 1 | - |
| | None | | | | | | | | | |
| HSRG Solution | None | - | 0% | 0% | 0% | 1.00 | 33 | 1.5 | 1 | - |
| | None | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None | - | 0% | 0% | 0% | 1.00 | 44 | 1.6 | 1 | - |
| | None | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Columbia Gorge Tributaries Chum (Upper Gorge) Population and Related Hatchery Programs

January 31, 2009



1 Columbia Gorge Tributaries Chum (Upper Gorge)

Historically, chum salmon were abundant in lower portions of the Columbia River and supported annual harvests of hundreds of thousands of fish. The majority of the historic chum habitat is inundated by the Bonneville Reservoir and passage of adult chum over Bonneville Dam may be problematic, although a few chum are observed crossing Bonneville Dam each year. It is unknown if these are adults returning to natural spawning areas upstream or strays from hatchery or natural production below Bonneville Dam.

Currently, the relative abundance of chum salmon is likely less than one percent of historical levels. Spawning is known to occur in only three streams (Hardy Creek, Hamilton Creek, and Grays River), none of which occur within the Upper Gorge Chum Population.

Presently, there are no recreational or commercial fisheries for chum salmon in the Columbia River, although some fish are incidentally taken in the gill-net fisheries for coho and Chinook salmon.

Chum emerge in mid-March and spend minimal time in freshwater. Chum migration is believed to be complete by early spring prior to late April-May.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- **ESA Status:** Upper Columbia Gorge chum are within the lower Columbia River Evolutionary Significant Unit (ESU) and are federally listed as Threatened, effective May 24, 1999.
- **Population Description:** This population is part of the Upper Gorge Chum Population, which is designated as a Contributing population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes current viability as Very Low with a viability goal of Medium.
- **Recovery Goal for Abundance:** 600
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (e.g., from EDT):** Unknown. For modeling purposes, the following was assumed: Productivity: 1.5; Capacity: 100.

2.2 Current Hatchery Programs Affecting this Population

Straying of hatchery-produced chum to this population is thought to be negligible.

- **Hatchery strays from in-basin integrated hatchery program –** None
- **Hatchery strays from in-basin segregated and out-of-basin hatchery programs –** None

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of

effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain unchanged at 1.5 returns per spawner. Average abundance of natural-origin spawners (NOS) remained unchanged at 33 adults. Incidental harvest of the natural and hatchery populations remained unchanged at 1 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates). HSRG Recommendations.

Observations

Few chum move upstream of Bonneville Dam. Information provided to the HSRG suggests that there is chum habitat potential in the lower portion of tributaries of the Columbia Gorge tributaries.

The HSRG understands that several hundred chum salmon pass upstream of Bonneville Dam. These fish may be a broodstock source for reintroduction of chum in the Columbia Gorge tributaries.

Recommendations

Since reintroduction of chum upstream of Bonneville has been established as a priority, a chum hatchery conservation program should be initiated as part of an overall chum salmon recovery strategy for the Columbia River Chum ESU. Potential candidate locations for chum reintroduction would be based on habitat surveys on both sides of the Columbia River.

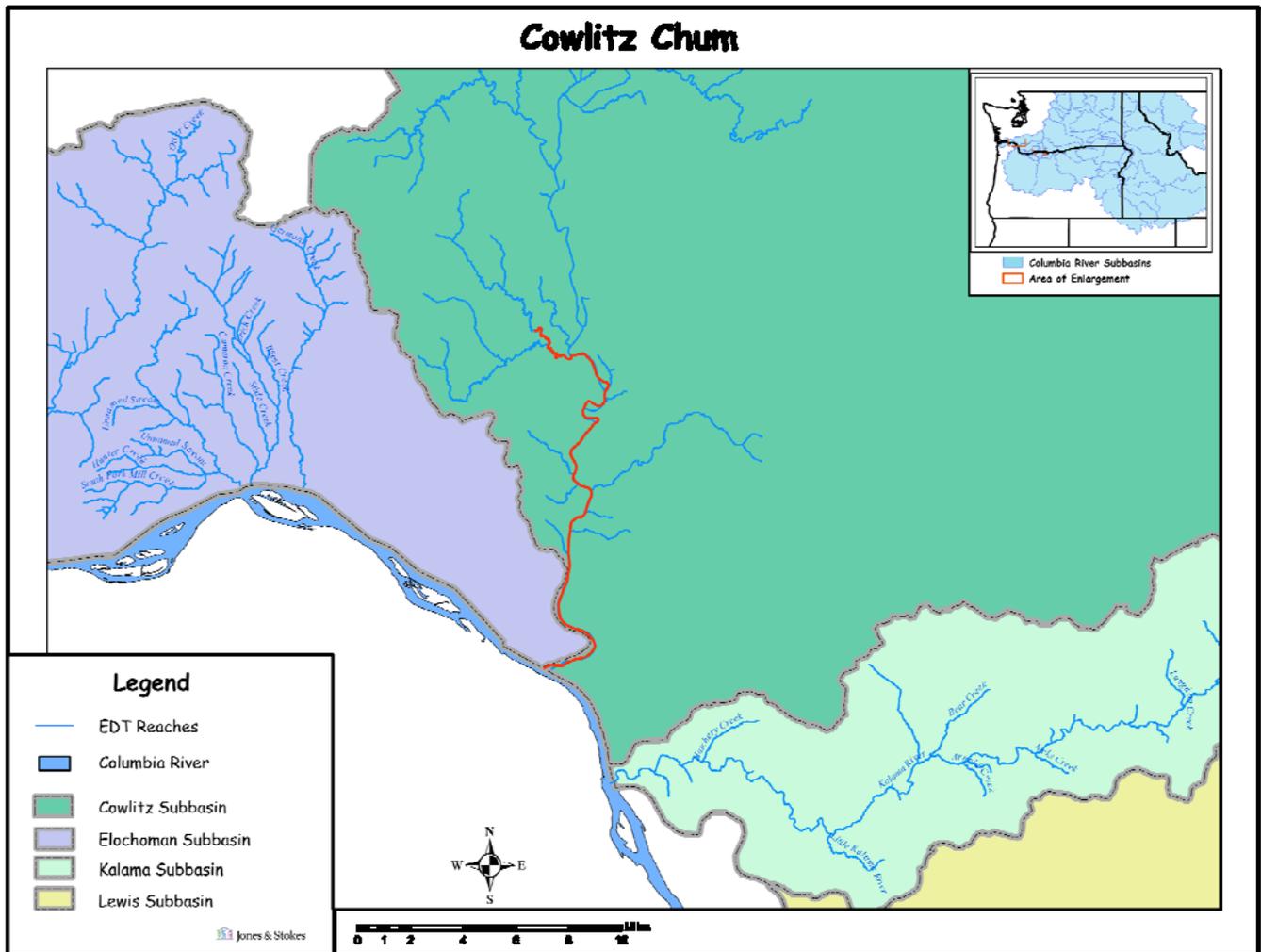
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Upper Columbia Gorge Tributaries Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 33 | 1.5 | 1 | - |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 33 | 1.5 | 1 | - |
| | | | | | | | | | | |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 33 | 1.5 | 1 | - |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 44 | 1.6 | 1 | - |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Cowlitz Chum Salmon Population and Related Hatchery Programs

January 31, 2009



1 Cowlitz Chum Salmon

This is one of 16 populations historically present in this ESU (Meyers et al. 2006). At one time over one million chum salmon returned to the lower Columbia River (McElhany 2005); currently few chum are observed. Run sizes range from a few hundred to a few thousand adults. Most chum salmon in the Lower Columbia River are observed in the Grays River and a few locations further upstream.

In 1951, 1,000 chum salmon were counted in the Cowlitz River. Historical chum salmon abundance ranged from 300,000 to 500,000 fish based on available habitat and habitat modeling. This estimate includes production from the mainstem, the lower Coweeman and Toutle rivers, and Ostrander Creek. Estimates of current run size are not available. Approximately 10 adults are recovered at the Cowlitz Hatchery each year.

There are two patterns of run timing in the Cowlitz River. The “summer run” enters the river in early summer and spawns higher in the watershed than the late time “fall run” of chum. Historically, chum spawned upstream of the Mayfield Dam site as well as in the lower tributaries of the Cowlitz River. It is unclear how the mainstem dams in the Cowlitz affected this run timing trait.

2 Current Conditions

2.1 Current Population Status and Goals

- **ESA Status:** This population is listed as threatened. The natural and hatchery populations of Cowlitz River chum salmon are included in the Columbia River Chum ESU.
- **Population Description:** The Cowlitz River chum population is designated as a Contributing population (LCSR&SP 2004).
- **Current Viability Rating:** Very Low, with a goal of Medium
- **Recovery Goal for Abundance:** 600
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (from EDT):** Productivity 1.6; Capacity 7,038
- **Populations Affected by this Hatchery Population:** NA
- **Hatchery Populations of the Same Species that may Affect this Natural Population:** The nearest hatchery programs that may affect this population are the Gray River and the Duncan/Ives Island programs.

2.2 Current Hatchery Programs Affecting this Population

No chum salmon hatchery program has ever operated in the Cowlitz River. Straying of hatchery-produced chum into the Cowlitz River is thought to be low. The effective pHOS is estimated to be 2%.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program – None
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – 60 adults

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase slightly from 1.5 to 1.6 returns per spawner. Average abundance of natural-origin spawners (NOS) would remain the same at 2,640 adults. Incidental harvest of the natural and hatchery populations remained unchanged at 54 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated a Contributing population that appears to have habitat potential to be productive and abundant. There are no hatchery releases in the Cowlitz River.

Recommendations

The HSRG recommends that managers monitor the abundance of natural-origin chum.

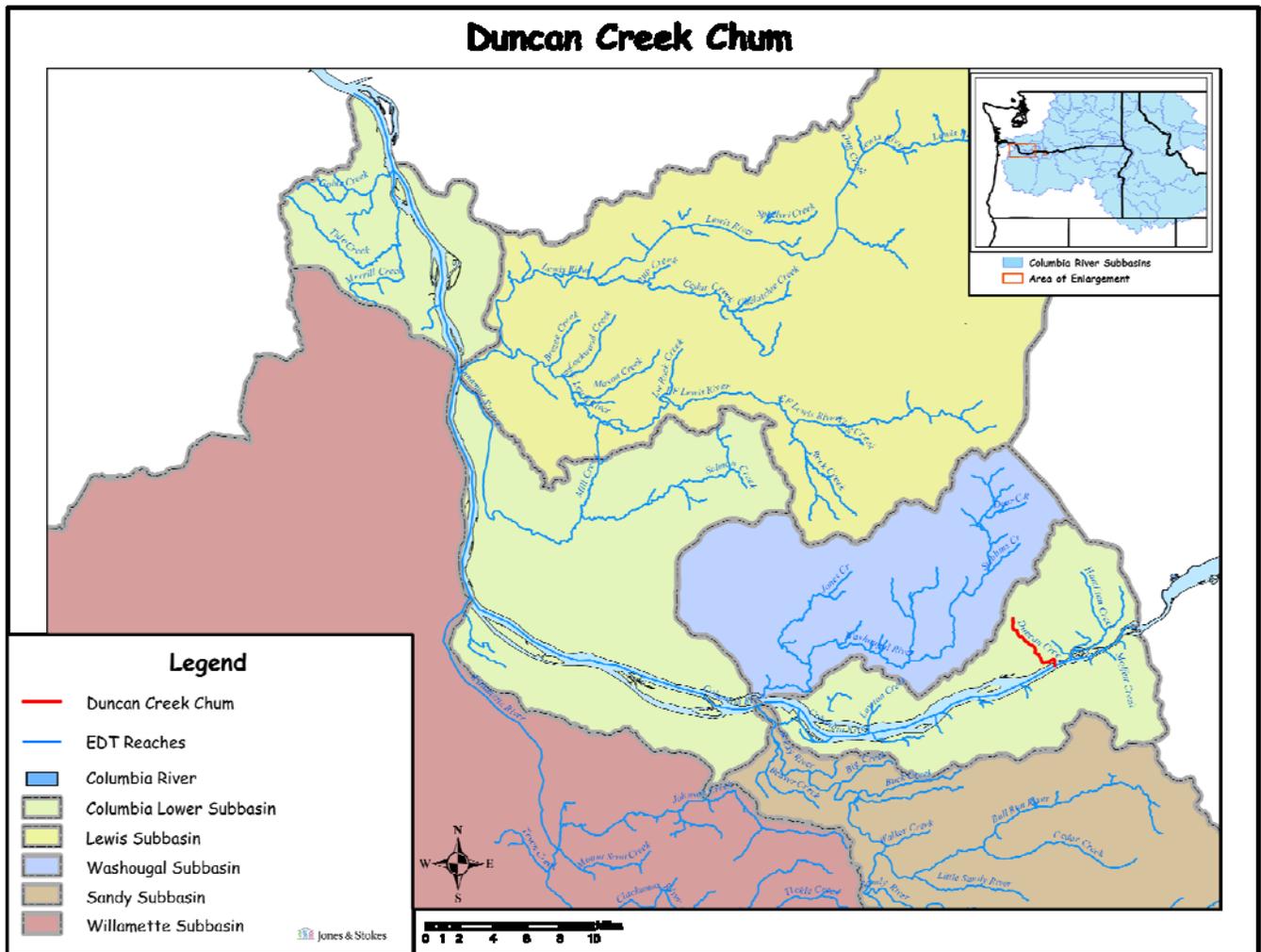
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Cowlitz Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 2% | 0.00 | 2,641 | 1.5 | 54 | - |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 2,639 | 1.6 | 54 | - |
| HSRG Solution | None None | - | 0% | 0% | 9% | 0.00 | 2,814 | 1.5 | 57 | - |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 8% | 0.00 | 3,503 | 1.6 | 71 | - |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Duncan Creek Chum Population and Related Hatchery Programs

January 31, 2009



1 Duncan Creek Chum

This population is part of the Columbia River Lower Gorge Tributaries identified in Meyers et al. (2006). It is analyzed as a separate unit to evaluate the Duncan/Ives Island chum conservation program. Natural spawning occurs in Duncan Creek and the Columbia River mainstem around Ives Island.

No information is available on run size or biological traits for this population component.

2 Current Conditions

2.1 Current Population Status and Goals

- **ESA Status:** Duncan Creek chum salmon are part of the Columbia River Chum ESU, which was listed as Threatened under the ESA on March 25, 1999.
- **Population Description:** Duncan Creek Chum population is part of the Lower Columbia Gorge population and is designated as a Primary population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes current viability as Medium+ with a viability goal of High+.
- **Recovery Goal for Abundance:** 2,800
- **Productivity Improvement Expectation:** NA
- **Habitat Productivity and Capacity (EDT based):** Productivity: 3.7; Capacity: 1,925

2.2 Current Hatchery Programs Affecting this Population

This is an integrated conservation program intended to help recover threatened chum salmon. Broodstock is collected in Duncan Creek and taken to Washougal Hatchery for spawning, incubation and early rearing. All hatchery progeny are otolith marked to distinguish hatchery fish from natural-origin chum. The current program goal is 100,000 fed fry at 450 fpp; however, in 2006 only 25,000 fry were produced. Fry are planted back into Duncan Creek. Additionally, salvaged adults from the Columbia River near Ives Island are released into Duncan Creek.

The goal of the program is a self-sustaining population in rehabilitated Duncan Creek habitat. This will be accomplished by a combination of juvenile supplementation and releases of wild chum salmon adults into renovated spawning habitat in Duncan Creek.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program – 1,035 adults
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – None

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value

of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase slightly from 3.5 to 3.6 returns per spawner. Average abundance of natural-origin spawners (NOS) would decrease from 1,650 to 1,520 adults. Incidental harvest of the natural and hatchery populations would decrease from 57 fish to 31 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is designated a Primary population with an existing hatchery program (100,000 release).

Recommendations

The HSRG recommends continuation of the hatchery program using local natural-origin broodstock as available and broodstock from natural origin returns from the Lewis River as necessary until the recovery goals are achieved and the population becomes self-sustaining. Fed fry should be adipose fin-clipped to distinguish HOR from NOR adults. This would allow collection of 100% NOR adults for broodstock to increase the PNI above 0.67. Monitor contribution of hatchery strays in spawning escapement and natural production.

This, like all chum conservation programs in the lower Columbia, should include a “sunset” clause that would suspend the hatchery program after three generations, unless evidence suggest suspending releases earlier or extending the program beyond three generations.

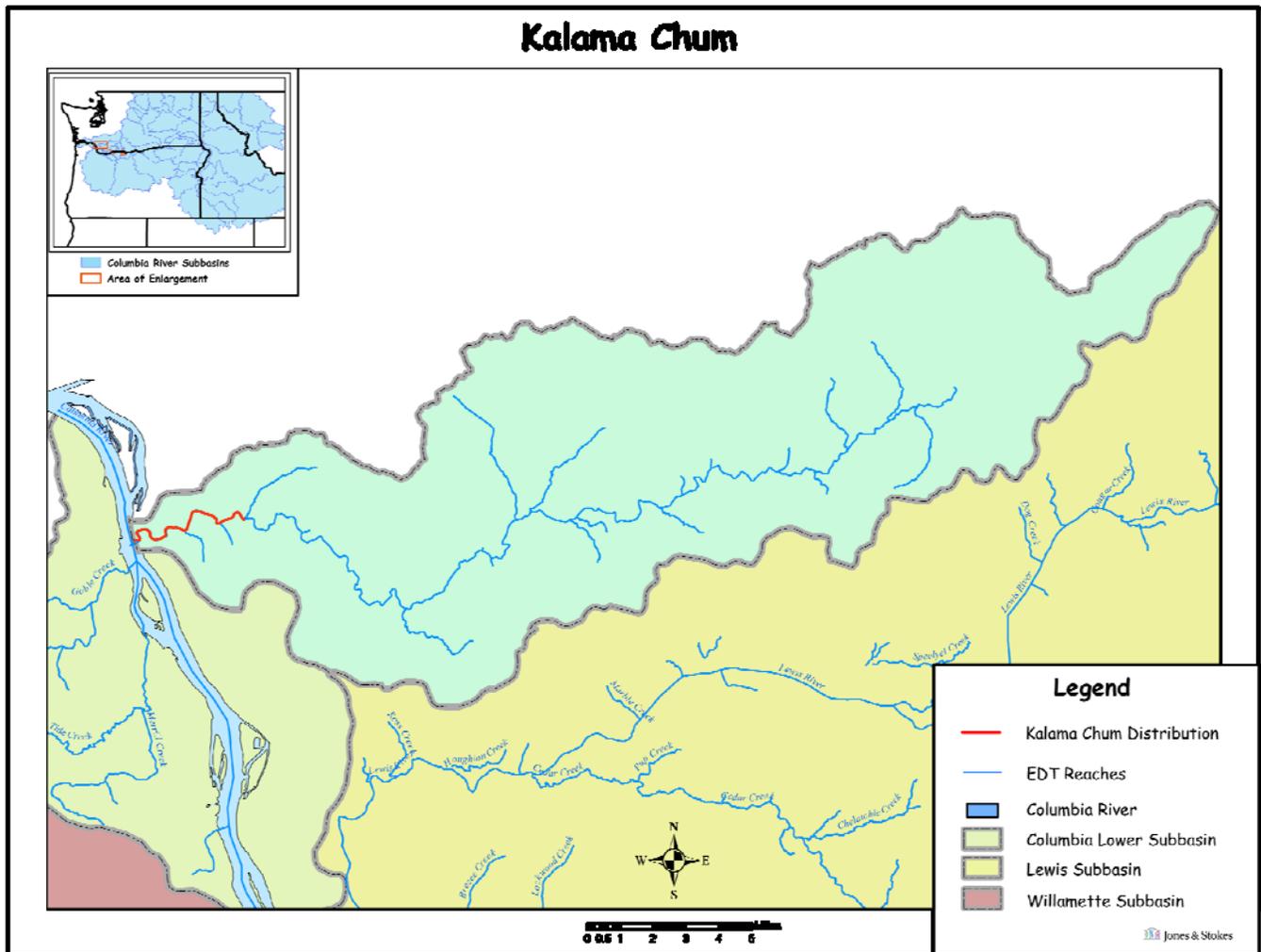
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Duncan Creek Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 99.9 | 5% | 0% | 37% | 0.62 | 1,652 | 3.5 | 57 | 25 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,515 | 3.6 | 31 | - |
| HSRG Solution | Int Cons | 99.9 | 5% | 0% | 38% | 0.72 | 1,630 | 3.6 | 57 | 55 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 99.9 | 5% | 0% | 36% | 0.74 | 1,826 | 3.9 | 61 | 55 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Kalama Chum Population and Related Hatchery Programs

January 31, 2009



1 Kalama Chum

This is one of 16 populations historically present in this ESU (Meyers et al. 2006). At one time over one million chum salmon returned to the lower Columbia River (McElhany 2005) while currently, few are observed. Run sizes range from a few hundred to a few thousand adults. Most chum salmon in the Lower Columbia River are observed in the Grays River and a few locations further upstream.

The historical run size of chum salmon to the Kalama was estimated to be between 15,000 and 40,000 adults based on habitat available and modeling. In 1951, 600 chum salmon were estimated to spawn in the Kalama River. Current natural spawning is estimated to be less than 50 fish. Chum spawn in the Kalama River from Modrow Bridge (RM 2.4) and lower Kalama Falls (RM 10).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Kalama chum salmon are part of the Columbia Chum ESU which was listed as Threatened under the ESA in 1999.
- Population Description: Kalama chum salmon is designated as a Contributing population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes current viability as Very Low with a viability goal of Low.
- Recovery Goal for Abundance: 150
- Productivity Improvement Expectation: NA
- Habitat Productivity and Capacity: Unknown. For modeling purposes, the following was assumed: Productivity: 1.5; Capacity: 1,000.

2.2 Current Hatchery Programs Affecting this Population

Straying of hatchery-produced chum to this population is thought to be negligible.

- Hatchery strays from in-basin integrated hatchery program – None
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – None

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly

greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain unchanged at 1.5 returns per spawner. Average abundance of natural-origin spawners (NOS) remained unchanged at approximately 330 adults. Incidental harvest of the natural and hatchery populations remained unchanged at 7 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

The HSRG has no specific observations or recommendations for this population.

Table 1. Results of HSRG analysis of current conditions and HSRG solution for Kalama Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 0% | 1.00 | 327 | 1.5 | 7 | - |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 327 | 1.5 | 7 | - |
| | None | | | | | | | | | |
| HSRG Solution | None | - | 0% | 0% | 33% | 0.00 | 532 | 1.3 | 11 | - |
| | None | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None | - | 0% | 0% | 30% | 0.00 | 612 | 1.5 | 12 | - |
| | None | | | | | | | | | |

1 Lewis River Chum

This is one of 16 populations historically present in this ESU (Meyers et al. 2006). At one time over one million chum salmon returned to the lower Columbia River (McElhany 2005). Currently, few chum are observed in the Lower Columbia. Run sizes range from a few hundred to a few thousand adults. Most chum salmon in the Lower Columbia River are observed in the Grays River and a few locations further upstream.

Historical chum salmon abundance ranged from 120,000 to 300,000 fish based on available habitat and habitat modeling. Current run size is estimated to be less than 100 fish. Habitat modeling suggests a current habitat potential of over 5,000 adults. Natural spawning occurs in the lower reaches of the mainstem, North Fork, East Fork, and in Cedar Creek. Adult spawning peaks in December. All chum are naturally produced as no hatchery fry are released in the Lewis River.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Lewis River chum salmon are part of the Columbia River Chum ESU, which was listed as Threatened under the ESA on March 25, 1999.
- Population Description: The Lewis River chum population is designated as a Primary population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes current viability as Very Low with a viability goal of High.
- Recovery Goal for Abundance: 1,100.
- Productivity Improvement Expectation: NA
- Habitat Productivity and Capacity (EDT based): Productivity: 2.5; Capacity: 12,860

2.2 Current Hatchery Programs Affecting this Population

No chum salmon hatchery program has ever operated in the Lewis River.

Straying of hatchery-produced chum into the Lewis River is thought to be low. The nearest hatchery program is the Duncan/Ives Island program. The effective pHOS is estimated to be ~1%. Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program – None
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – 60 adults

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value

of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain unchanged at 2.4 returns per spawner. Average abundance of natural-origin spawners (NOS) would also remain unchanged at 8,200 adults. Incidental harvest of the natural and hatchery populations remained unchanged at 167 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated a Primary population.

Recommendations

The HSRG recommends that managers monitor chum salmon abundance in the Lewis River. Consider this a likely population for a small conservation hatchery program.

Implement a low cost conservation program (130,000 fed fry release) using local natural-origin broodstock as available and broodstock from natural origin returns from the Cowlitz and Kalama rivers as necessary. All hatchery-origin fish would need to be marked (adipose fin-clipped) and the proportion of hatchery fish on the spawning grounds monitored. Monitor the contribution of hatchery strays in the spawning escapement and natural production.

This, like all chum conservation programs in the lower Columbia, should include a “sunset” clause that would suspend the hatchery program after three generations, unless evidence suggests suspending releases earlier or extending the program beyond three generations would benefit the population.

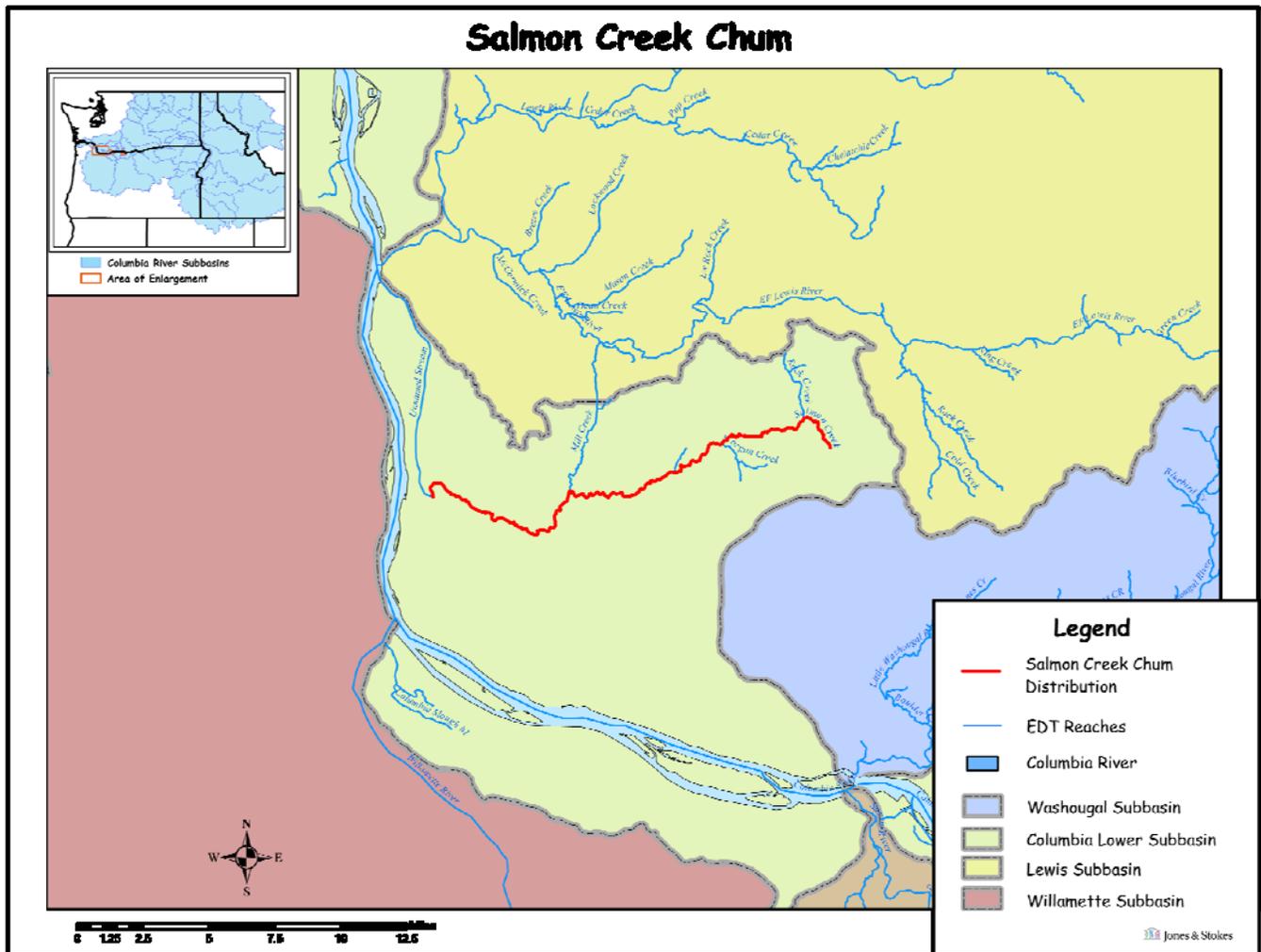
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Lewis River Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 8,196 | 2.4 | 167 | - |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 8,200 | 2.4 | 167 | - |
| | | | | | | | | | | |
| HSRG Solution | Int Cons | 256.4 | 0% | 0% | 24% | 0.81 | 9,286 | 2.4 | 251 | - |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 256.4 | 0% | 0% | 21% | 0.82 | 10,566 | 2.7 | 277 | - |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon Creek Chum Population and Related Hatchery Programs

January 31, 2009



1 Salmon Creek Chum

This is one of 16 populations historically present in this ESU (Meyers et al. 2006). At one time over one million chum salmon returned to the lower Columbia River (McElhany 2005); currently few chum are observed here. Run sizes range from a few hundred to a few thousand adults. Most chum salmon in the Lower Columbia River are observed in the Grays River and a few locations further upstream.

Salmon Creek is located adjacent to the Washougal River. No information is available for this population.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Chum spawning in Salmon Creek are part of the Columbia Chum ESU which was listed as Threatened under the ESA in 1999.
- Population Description: Salmon Creek chum is designated as a Stabilizing population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes current viability as Very Low with a viability goal of Very Low.
- Recovery Goal for Abundance: 75
- Productivity Improvement Expectation: NA
- Habitat Productivity and Capacity: Unknown. For modeling purposes, the following assumption was made: Productivity: 1.5; Capacity: 1000.

2.2 Current Hatchery Programs Affecting this Population

Straying of hatchery-produced chum to this population is thought to be moderate from hatchery programs in the Grays and at Duncan/Ives Island.

- Hatchery strays from in-basin integrated hatchery program – None
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – 21

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase slightly from 1.4 to 1.5 returns per spawner. Average abundance of natural-origin spawners (NOS) remained unchanged at approximately 330 adults. Incidental harvest of the natural and hatchery populations remained unchanged at 7 fish.

3.2 HSRG Observations/Recommendations

Summary results of our analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

The HSRG has no specific observations or recommendations for this population.

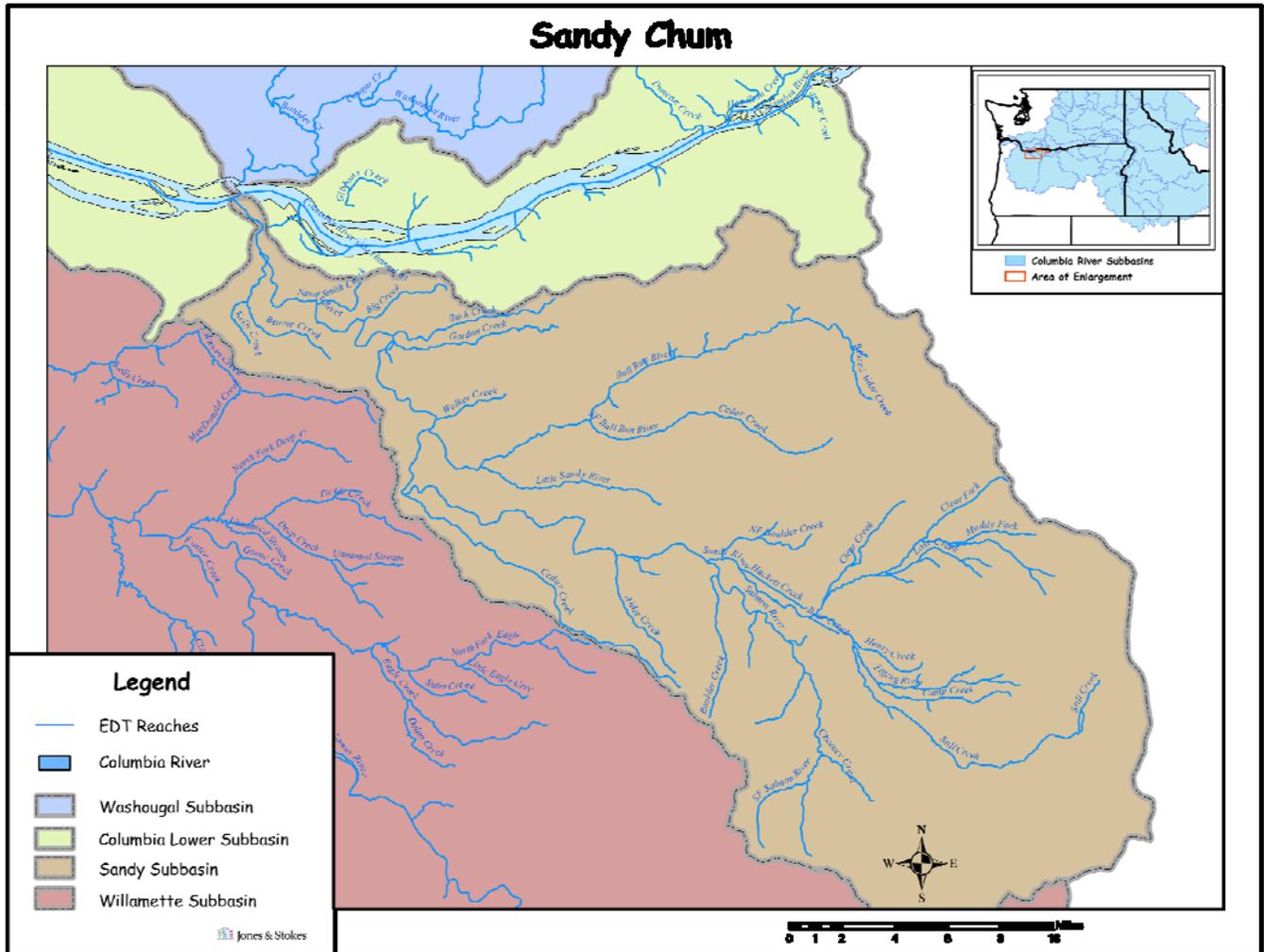
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Salmon Creek Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 6% | 0.00 | 336 | 1.4 | 7 | - |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 327 | 1.5 | 7 | - |
| | None | | | | | | | | | |
| HSRG Solution | None | - | 0% | 0% | 18% | 0.00 | 418 | 1.3 | 9 | - |
| | None | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None | - | 0% | 0% | 16% | 0.00 | 503 | 1.5 | 10 | - |
| | None | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Sandy River Chum Population and Related Hatchery Programs

January 31, 2009



1 Sandy Chum

This is one of 16 populations historically present in this ESU (Meyers et al. 2006). At one time over one million chum salmon returned to the lower Columbia River (McElhany 2005). Currently few chum are observed in the Lower Columbia. Run sizes range from a few hundred to a few thousand adults. Most chum salmon in the Lower Columbia River are observed in the Grays River and a few locations further upstream.

No information is available on run size or biological traits for the Sandy River.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Sandy River chum are part of the Columbia River Chum ESU, which was listed as Threatened under the ESA on March 25, 1999.
- Population Description: The Sandy River chum population is designated as a Primary population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes current viability as NA with a viability goal of High.
- Recovery Goal for Abundance: The goal is unknown. The viable abundance is 1,100 and the potential abundance is 2,200.
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity (e.g., from EDT): Unknown; used productivity of 1.5 and a capacity of 1000 for modeling purposes.

2.2 Current Hatchery Programs Affecting this Population

No chum salmon hatchery program has ever operated in the Sandy River.

Straying of hatchery-produced chum into the Sandy River is thought to be moderate because of proximity to the Duncan/Ives Island program. The effective pHOS is estimated to be 12%.

- Hatchery strays from in-basin integrated hatchery program – None
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – 53 adults

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly

greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase slightly from 1.4 to 1.5 returns per spawner. Average abundance of natural-origin spawners (NOS) would decrease from 372 to 327 adults. Incidental harvest of the natural and hatchery populations changed from 8 fish to 7 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated a Primary population that may have habitat potential to support chum salmon. There are no hatchery releases in the Sandy River.

Recommendations

Monitor abundance of natural origin chum and contribution of hatchery strays.

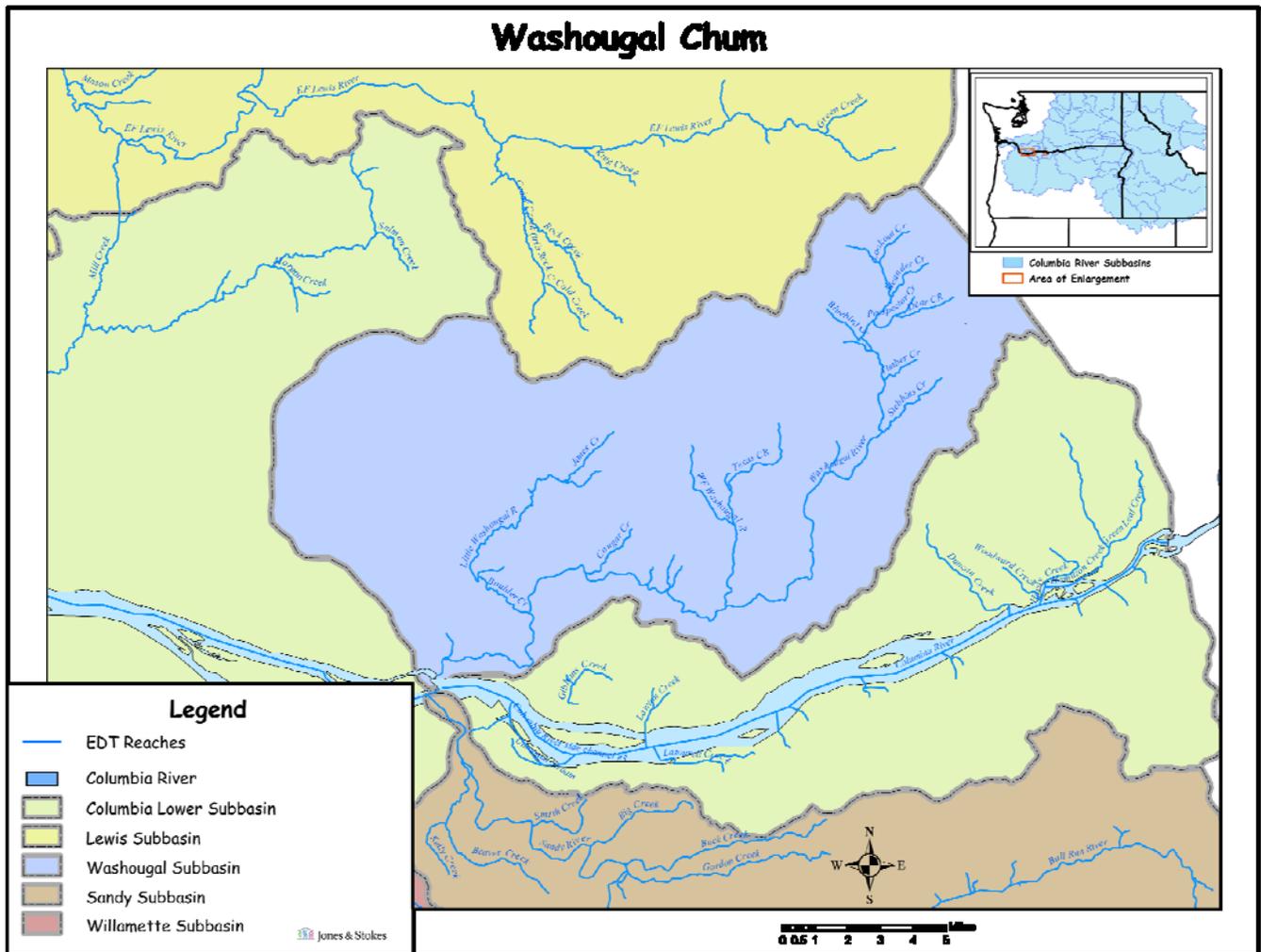
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Sandy River Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 12% | 0.00 | 372 | 1.4 | 8 | - |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 327 | 1.5 | 7 | - |
| HSRG Solution | Int Cons | 96.1 | 0% | 0% | 64% | 0.61 | 709 | 1.4 | 37 | - |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 96.1 | 0% | 0% | 61% | 0.62 | 798 | 1.6 | 39 | - |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Washougal Chum Population and Related Hatchery Programs

January 31, 2009



1 Washougal River Chum

This is one of 16 populations historically present in this ESU (Meyers et al. 2006). At one time over one million chum salmon returned to the lower Columbia River (McElhany 2005); currently few chum are observed. Run sizes range from a few hundred to a few thousand adults. Most chum salmon in the Lower Columbia River are observed in the Grays River and a few locations further upstream.

Historical chum salmon abundance ranged from 25,000 to 40,000 fish based on available habitat and habitat modeling. Current run size is less than 100 fish in the Washougal River and less than 1,000 fish in the Washougal area. This population includes chum spawning in the Columbia River mainstem and tributaries near the I-205 Bridge.

2 Current Conditions

2.1 Current Population Status and Goals

- ESA Status: This population is listed as threatened. The natural and hatchery populations of Washougal River chum salmon are included in the Columbia River Chum ESU.
- Population Description: The Washougal River chum population is designated as a primary population (LCSR&SP 2004).
- Current Viability Rating: Low with a goal of High+
- Recovery Goal for Abundance: 5,200
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity (from EDT): Productivity 3.0; Capacity 2,783
- Populations Affected by this Hatchery Population: NA
- Hatchery Populations of the Same Species that may Affect this Natural Population: The nearest hatchery program that may affect this population is the Duncan/Ives Island program.

2.2 Current Hatchery Programs Affecting this Population

No chum salmon hatchery program has ever operated in the Washougal River.

Straying of hatchery-produced chum into the Washougal River is thought to be low. The effective pHOS is estimated to be 1%.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program – None
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – 21 adults

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For

integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain the same at 2.9 returns per spawner. Average abundance of natural-origin spawners (NOS) would also remain the same at 2,000 adults. Incidental harvest of the natural and hatchery populations remains unchanged at 40 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated a Primary population that appears to have habitat potential to be productive and abundant. There are no hatchery releases in the Washougal River.

Recommendations

The HSRG recommends that managers monitor abundance of natural-origin chum.

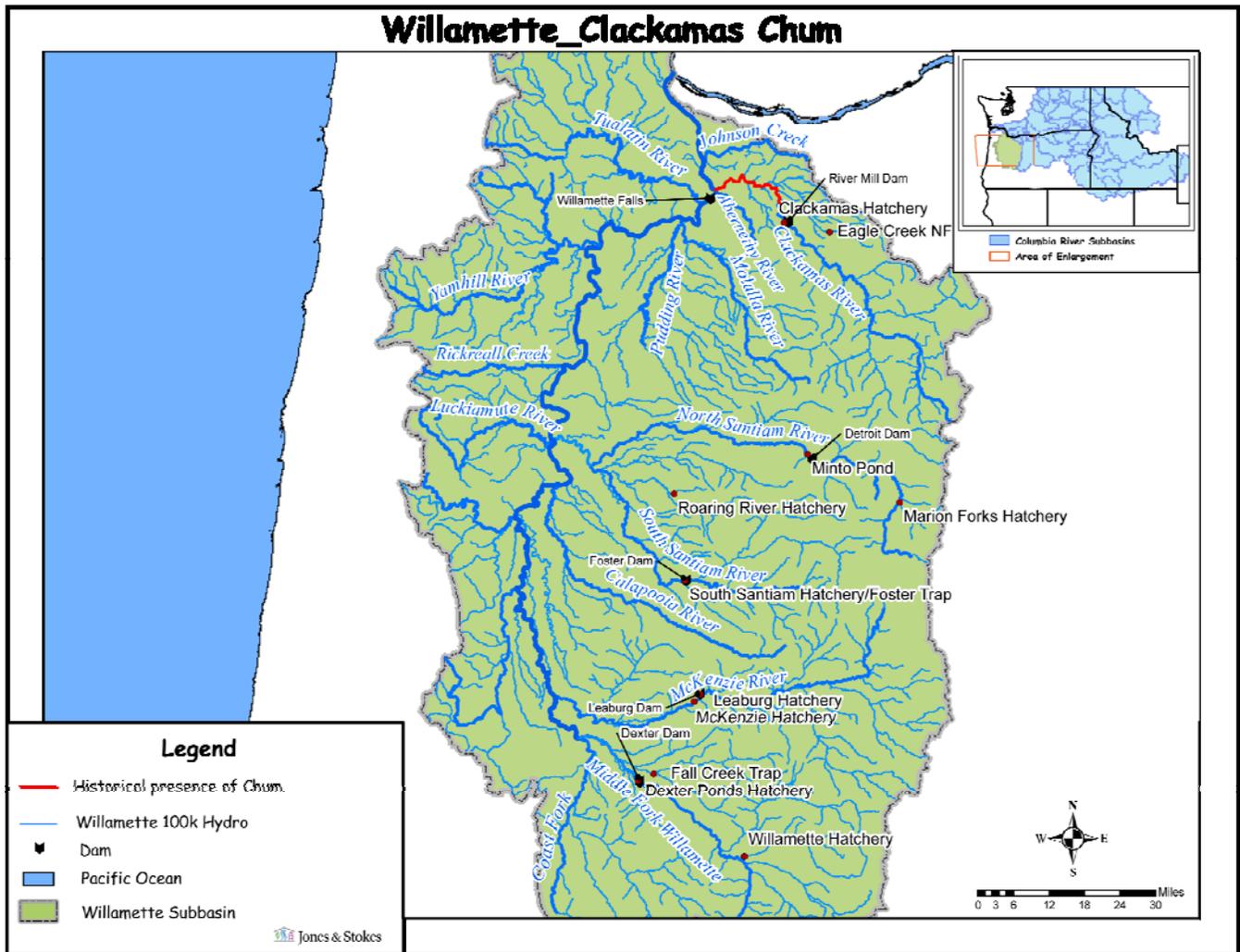
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Washougal Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 1,986 | 2.9 | 41 | - |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,989 | 2.9 | 41 | - |
| HSRG Solution | Int Cons | 217.9 | 0% | 0% | 50% | 0.66 | 2,284 | 2.9 | 99 | - |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 217.9 | 0% | 0% | 48% | 0.68 | 2,559 | 3.2 | 104 | - |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Willamette - Clackamas Chum Salmon Population and Related Hatchery Programs

January 31, 2009



1 Clackamas Chum Salmon

The Clackamas chum population is part of the Columbia River Chum ESU, which includes all naturally-spawning populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon. Historically, over a million chum returned to the Columbia River in some years (McElhany 2005). Recently only a few hundred to a few thousand chum have returned each year to the Columbia, to a very restricted subset of the historical range in the Washington side of the Columbia: Grays River, immediately below Bonneville Dam (Hardy and Hamilton creeks) and, to a lesser extent, under the I-205 bridge near Vancouver (McElhany 2005).

Preliminary WLC-TRT analyses suggest that 14 of the 16 historical populations (88%) are extinct or nearly so. The two extant populations (Grays River and Lower Columbia River Tributaries) have been at low abundance for the last 50 years in the range where stochastic processes could lead to extinction. The abundance of these two populations has recently increased substantially and spawning population has recently been discovered in the Washougal River.

All of the eight historical Oregon side populations, including the Clackamas, are considered extirpated or nearly so. By 1944, chum salmon were not found during biological surveys of the Clackamas River (Dimick and Merryfield 1945). In 2000, ODFW conducted surveys at 30 sites within the Oregon side historical distribution and observed only one chum salmon. Currently, chum are occasionally observed in Oregon and may be intercepted at hatchery weirs or at dam passage facilities (e.g., North Fork Dam on the Clackamas River).

Barin (1886) observed that adult chum appeared in the Clackamas River by November and spawned soon afterward. Chum salmon usually spawn in coastal areas, and juveniles outmigrate to sea water almost immediately following emergence from the redds (Salo 1991). Therefore, survival and growth in juvenile chum salmon depends less on freshwater conditions than on favorable estuarine conditions.

No targeted commercial or sport fisheries occur in the mainstem Columbia River for chum salmon. Sport angling for chum was closed in Oregon in 1992. Chum salmon are incidentally harvested in the Columbia River during the late-period coho gill net fishery; less than 42 were captured in 1994. The BRT has noted that chum salmon populations have benefited from reductions in Columbia River gill net fisheries aimed at protecting listed upriver Chinook salmon populations.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- **ESA Status:** Willamette Clackamas chum are part of the Columbia River Chum ESU, which was listed as Threatened under the ESA March 25, 1999.
- **Population Description:** The Clackamas River chum population is designated as a Contributing population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP, 2004). The LCSR&SP describes current viability as NA with a viability goal of Medium.
- **Recovery Goal for Abundance:** The goal is unknown. The viable abundance is 1,100 and the potential abundance is 2,200.

- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity (e.g., from EDT): Unknown; used productivity of 1.5 and a capacity of 100 for modeling purposes.

2.2 Current Hatchery Programs Affecting this Population

No chum salmon hatchery program has ever operated in the Clackamas River.

Straying of hatchery-produced chum into the Clackamas River is thought to be negligible. The effective pHOS is estimated to be 0%.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain the same at 1.5 returns per spawner. Average abundance of natural-origin spawners (NOS) would also remain the same at 33 adults. Incidental harvest of the natural and hatchery populations remained unchanged at 1 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

3.2.1 HSRG Recommendations

No observations or recommendations were made.

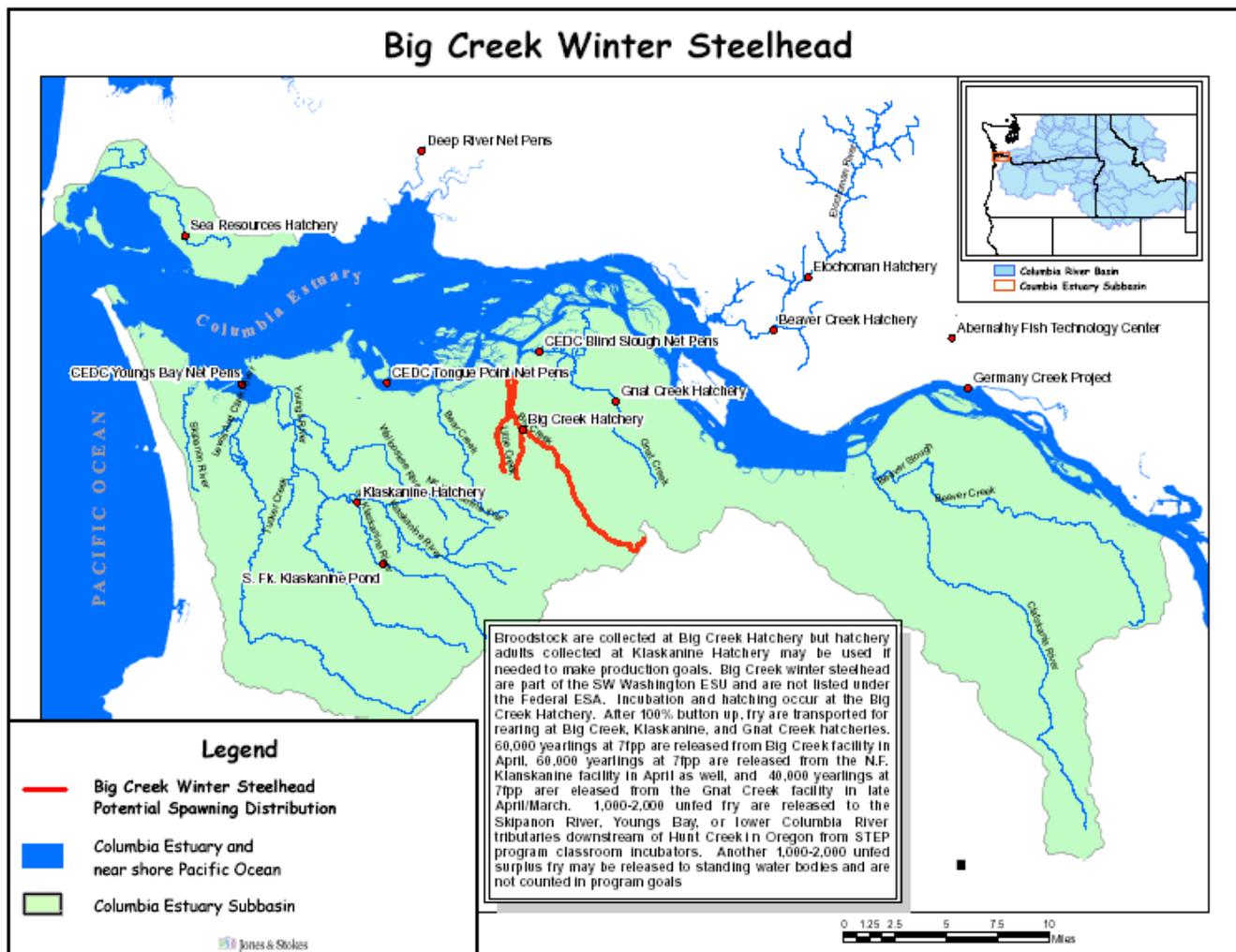
Table 1. Results of HSRG analysis of current conditions and HSRG solution for Clackamas Chum. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 0% | 1.00 | 33 | 1.5 | 1 | - |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 33 | 1.5 | 1 | - |
| | None | | | | | | | | | |
| HSRG Solution | None | - | 0% | 0% | 0% | 1.00 | 33 | 1.5 | 1 | - |
| | None | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None | - | 0% | 0% | 0% | 1.00 | 44 | 1.6 | 1 | - |
| | None | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Big Creek Winter Steelhead Population Population and Related Hatchery Programs

January 31, 2009



1 Big Creek Winter Steelhead

The Big Creek winter steelhead population has been greatly influenced by long-term, annual releases of domesticated hatchery steelhead. Currently, only unmarked steelhead are passed above the hatchery weir; a high proportion of these fish are likely misidentified hatchery-origin fish. There may be 12-16 miles of degraded steelhead habitat in Big Creek above the hatchery weir. Natural production in Big Creek is currently being evaluated under a three-year study by CREST. Conservation or population management objectives for natural Big Creek steelhead are not available. Big Creek stock is used to supplement populations in Gnat Creek and the Klaskanine River.

2 Current Conditions

2.1 Current Population Status and Goals

Big Creek steelhead are part of the Southwest Washington Coast ESU and are not ESA-listed. The HSRG is not aware of any management objective for natural production of Big Creek steelhead. Natural production is uncertain, but expected to be low.

- ESA Status: This population is not listed.
- Population Description: Minor population greatly influenced by long-term hatchery propagation
- Current Viability Rating: Likely Very Low. The CREST study may provide future information on smolt production relative to adult spawning population.
- Recovery Goal for Abundance: NA
- Habitat Productivity and Capacity: Productivity: 4.0; Capacity: 100 assigned for this review

2.2 Current Hatchery Programs Affecting this Population

The current program produces 60,000 marked smolts of Big Creek stock that are released at 7 fpp on-station in April. Broodstock is collected at Big Creek Hatchery with occasional contribution of broodstock from Klaskanine Hatchery when returns to Big Creek are insufficient. Approximately 60,000 fingerlings at 14 fpp are transferred to Klaskanine Hatchery for later release in the Klaskanine River. Up to 40,000 fingerlings at 14 fpp are transferred to Gnat Creek Hatchery for later release in Gnat Creek. Small numbers of eggs are provided to STEP and USFWS for research.

- PNI and pHOS Estimates (include straying from all hatchery programs): pHOS is estimated at 3%.
- Estimated productivity (with harvest and fitness factor effects from AHA): 2.8 for the natural population
- Projected Average Natural Origin Escapement: 56 natural-origin adults
- Average Harvest Contribution: 426 fish

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – 16 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.8 to 3.6. Average abundance of natural-origin spawners (NOS) would increase from approximately 56 fish to approximately 73 fish. Harvest contribution of the natural and hatchery populations would go from approximately 426 fish to approximately 7 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations:

This population is considered a Stabilizing population. There is a 60,000 segregated winter steelhead smolt program here.

Recommendations:

The HSRG recommends continuing the current smolt program. Continue the CREST study to evaluate natural production potential upstream of the hatchery weir. It is likely that many unmarked steelhead are misidentified hatchery fish. It is recommended that real-time scale analysis should be employed to ensure misidentified, unmarked hatchery steelhead are not passed upstream.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Big Creek Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 95% | 0% | 3% | 0.00 | 56 | 2.8 | 6 | 0 |
| | Seg Harv | 60.0 | 95% | | | | | | 420 | 205 |
| No Hatchery | None None | - | 0% | 0% | 0% | 0.00 | 73 | 3.6 | 7 | - |
| HSRG Solution | None None | - | 98% | 0% | 2% | 0.00 | 64 | 3.2 | 7 | 0 |
| | Seg Harv | 60.0 | 98% | | | | | | 420 | 217 |
| HSRG Solution w/ Improved Habitat | None None | - | 98% | 0% | 2% | 0.00 | 75 | 3.6 | 8 | 0 |
| | Seg Harv | 60.0 | 98% | | | | | | 420 | 217 |

1 Elochoman River Winter Steelhead

Elochoman winter steelhead were identified as a stock based on their distinct spawning distribution. Most spawning takes place in the Elochoman River and tributaries such as Beaver, Duck, Clear, Rock and Otter creeks. Spawning also occurs in the North, East and West forks of the Elochoman from March through early June. Stock status was rated Depressed in 2002 because of chronically low escapements. An escapement goal of 626 fish has been established for this stock. Despite the improvement in 2000, escapements have been low since 1991.

Genetic sampling was conducted in 1995; however, comparisons of allele frequencies between this stock and other lower Columbia steelhead stocks for determining stock distinctiveness are not very informative (Myers et al. 2002).

2 Current Conditions

2.1 Current Population Status and Goals

The Elochoman River currently has three steelhead populations comprised of a late winter natural steelhead run, an early winter hatchery steelhead population (introduced Chambers Creek stock) currently managed as a segregated-harvest program, and a summer steelhead population (introduced Lewis River stock, via Skamania) also managed as a segregated-harvest program.

- **ESA Status:** This population is part of the Southwest Washington DPS, which is not listed under ESA. This DPS includes all natural-origin steelhead in the Columbia-Estuary-Washington province, Willapa Bay tributaries and Grays Harbor tributaries.
- **Population Description:** Elochoman River steelhead are classified as a Contributing stock to ESU viability.
- **Current Viability Rating:** 400 adults.
- **Recovery Goal for Abundance:** 700
- **Productivity Improvement Expectation:** 8 to 10% has been discussed
- **Habitat Productivity and Capacity (from EDT):** Productivity: 7.49; Capacity: 515

2.2 Current Hatchery Programs Affecting this Population

There are currently two hatchery steelhead programs in the Elochoman River, an early winter run and a summer run program. Both are segregated harvest programs.

Early Winter Steelhead Program:

- Eyed-egg objective of broodstock collected in Elochoman is 200,000 eyed eggs of which 90,000 are released as smolts in the Elochoman
- 50,000 eyed eggs transferred to Grays River Hatchery for a 40,000 smolt release
- 5,000 smolts outplanted into Coweeman River
- 15,000 smolts transferred to Coweeman Pond for acclimation and release into Coweeman River
- Hatchery-produced fish in excess of release and transfer goals are outplanted to lakes in Wahkiakum County

- Current R/S for hatchery-produced fish is estimated to be an average of 23.5 recruits/spawner. This works out to a SAR of $\approx 1.8\%$.
- Mean terminal harvest in Elochoman River on early-run winter hatchery steelhead: 1,486 adults/year (range: 302-2,928 adults; 1990/91-2002/03; HGMP)
- Mean numbers of adult returns back to hatchery: 190.5 adults (range: 52-402 adults; 1990/91-2002/03; HGMP)
- All hatchery-origin adults trapped at the hatchery are spawned (this is an interpretation from HGMP)

Coweeman Early Winter-Run hatchery steelhead outplants (from Elochoman)

- Average harvest = 92.5 fish/year (1993/94-2002/03; HGMP)
- Average harvest SAR = 0.31% smolt to adult harvest return

Grays River Winter-Run hatchery steelhead transfers and releases

- Average harvest = 233 fish/year (1990/91-2002/03; HGMP)
- Average harvest SAR = 0.58% smolt to adult harvest return

Summer Steelhead Program (Merwin):

- No historic run of summer steelhead in the Elochoman River
- ESA status – not listed and not a candidate for listing
- No viability abundance goal for summer steelhead in Elochoman River
- Hatchery population is an introduced Lewis River stock where 35,000 eggs are collected, incubated and reared at the Merwin Hatchery to 22 fish per pound (fpp). They are marked and then transferred to the Elochoman Hatchery (in early October) for final rearing and volitional release at 5 fpp in late April and May. The stock is currently managed as a segregated-harvest program.
- Mean terminal harvest in Elochoman River on summer-run hatchery steelhead: 239 adults/year (range: 89-518 adults; 1992/93-2002/03; HGMP)
- Current SAR for “smolt-to-harvest” in Elochoman River: 0.70% smolt-to-adult harvest return
- Current R/S for hatchery produced fish is estimated to be an average of 12.0 recruits/spawner based on 25 adults necessary to produce a release of 30,000 smolts.

Hatchery populations of the same species that could affect this population (e.g., through straying) would include any Columbia Basin stock that might stray into the Elochoman River as they migrate through the lower mainstem Columbia. Several of the closest hatchery populations include the Cowlitz and the Kalama river programs.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program – from AHA summary: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – from AHA summary: 138

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For

populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 4.6 to 7.0. Average abundance of natural-origin spawners (NOS) would increase from 348 to 459. Harvest contribution of the natural and hatchery populations would go from 1,751 to 34.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The late winter component has been designated a Contributing population and these guidelines are currently being met. There is no native summer steelhead population in this basin. There are two segregated hatchery programs, an early winter (90,000 smolts) and a summer steelhead program (30,000 smolts). The summer hatchery program is less productive (smolt to adult survival rate) than the winter hatchery program.

The HSRG suggests that managers consider the ecological effect on this population. While these outplants do not appear to be having a genetic effect, considering Kostow's data for summer steelhead, the HSRG urges caution (Kostow 2003, 2004, 2006).

Recommendations

The current programs are consistent with the designation as a Contributing population. The HSRG has no specific recommendations to modify this program. If the barrier dam were more effective, it is possible that the program would meet the genetic guidelines for a primary population.

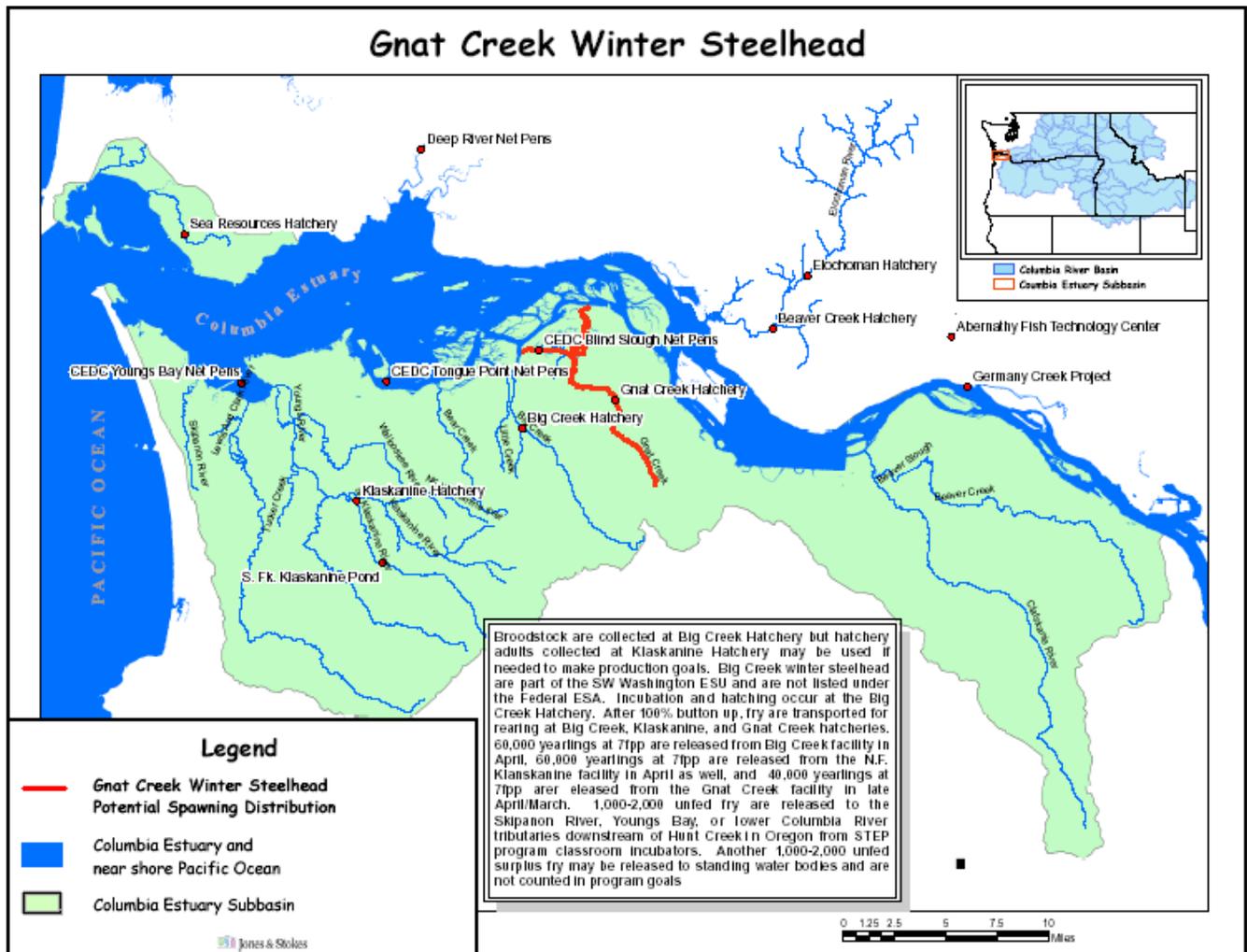
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Elochoman Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-----------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | 0.0 | 75% | 0% | 6% | 0.00 | 348 | 4.6 | 26 | 0 |
| | Seg Harv | 90.7 | 75% | | | | | | 1,486 | 44 |
| | Summer Stlhd Seg Harv | 30.9 | 0% | | | | | | 239 | 1 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 459 | 7.0 | 34 | - |
| HSRG Solution | None None | 0.0 | 90% | 0% | 4% | 0.00 | 374 | 5.1 | 28 | 0 |
| | Seg Harv | 90.7 | 75% | | | | | | 1,486 | 105 |
| | Summer Stlhd Seg Harv | 30.9 | 0% | | | | | | 239 | 1 |
| HSRG Solution w/ Improved Habitat | None None | 0.0 | 90% | 0% | 4% | 0.00 | 434 | 5.9 | 32 | 0 |
| | Seg Harv | 90.7 | 75% | | | | | | 1,486 | 105 |
| | Summer Stlhd Seg Harv | 30.9 | 0% | | | | | | 239 | 1 |

Hatchery Scientific Review Group Review and Recommendations

Gnat Creek Winter Steelhead Population Population and Related Hatchery Programs

January 31, 2009



1 Gnat Creek Winter Steelhead

Gnat Creek is a small Oregon tributary that enters the Columbia River about 17 miles east of Astoria. Gnat Creek has an impassable falls shortly above the hatchery so little habitat is available to support natural spawning.

2 Current Conditions

2.1 Current Population Status and Goals

This is a hatchery population, the purpose of which is to support harvest. This program obtains 40,000 winter steelhead from the Big Creek Hatchery in December which are then reared to 7 fpp and released directly into Gnat Creek in early April.

- ESA Status: This population is not listed. It is within the Southwest Washington Coast Steelhead DPS.
- Population Description: Little habitat exists in Gnat Creek to support a viable natural population. An impassible falls is located immediately above the hatchery. The current population is hatchery origin. Any natural-origin steelhead would likely be progeny of hatchery fish. Unmarked steelhead are also likely mismarked hatchery fish.
- Current Viability Rating: Likely Very Low
- Recovery Goal for Abundance: NA.
- Productivity Improvement Expectation: Very low
- Habitat Productivity and Capacity: Productivity: 4.0; Capacity: 25 assigned for this review

2.2 Current Hatchery Programs Affecting this Population

The hatchery program releases 40,000 marked smolts at 7 fpp. Broodstock origin is Big Creek Hatchery and occasionally Big Creek stock from Klaskanine Hatchery. Juvenile steelhead are received at Gnat Creek Hatchery in December, and then reared until release in early April.

- pHOS Estimates (include straying from all hatchery programs): 18%
- Estimated productivity (with harvest and fitness factor effects from AHA): 1.81
- Projected Average Natural Origin Escapement: 9 adults
- Average Harvest Contribution: 118 adults

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 16 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value

of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.8 to 3.6. Average abundance of natural origin spawners (NOS) would increase from approximately 9 fish to approximately 18 fish. Harvest contribution of the natural and hatchery populations would go from approximately 118 fish to approximately 2 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is considered a Stabilizing population. There is a 40,000 segregated winter steelhead smolt release program.

Recommendations

The HSRG has no specific recommendations for this program.

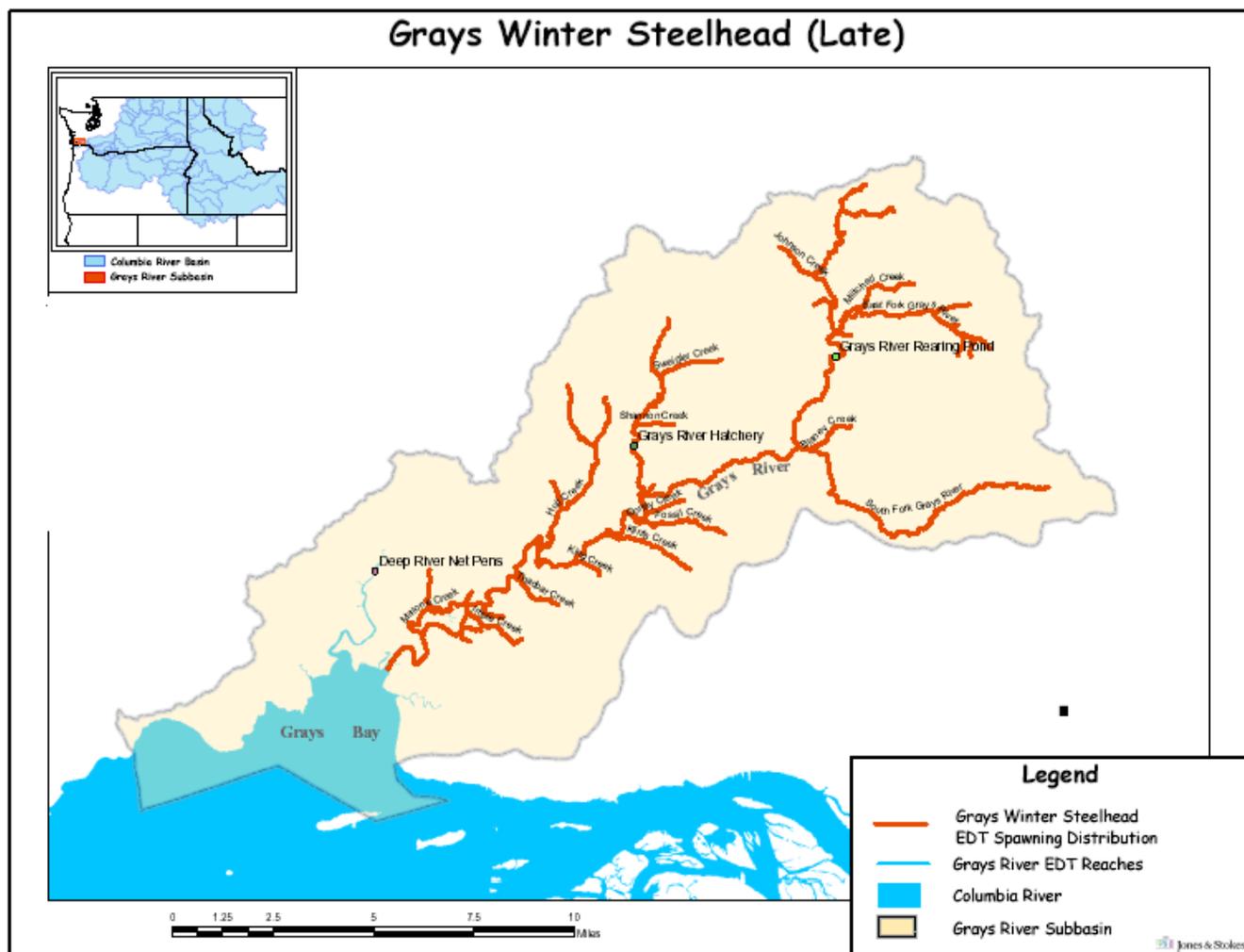
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Gnat Creek Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 90% | 0% | 18% | 0.00 | 9 | 1.8 | 1 | 0 |
| | Seg Harv | 40.0 | 90% | | | | | | 117 | 96 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 18 | 3.6 | 2 | - |
| HSRG Solution | None None | - | 90% | 0% | 12% | 0.00 | 9 | 1.9 | 1 | 0 |
| | Seg Harv | 40.0 | 90% | | | | | | 117 | 96 |
| HSRG Solution w/ Improved Habitat | None None | - | 90% | 0% | 9% | 0.00 | 11 | 2.2 | 1 | 0 |
| | Seg Harv | 40.0 | 90% | | | | | | 117 | 96 |

Hatchery Scientific Review Group Review and Recommendations

Grays River Winter Steelhead Population and Related Hatchery Programs

January 31, 2009



Grays River Winter Steelhead

1 Grays River Winter Steelhead

Grays winter steelhead were identified as a stock based on their distinct spawning distribution. Spawning takes place throughout the mainstem Grays River and in the East, West and South forks of the Grays. Spawning generally occurs from March through early June. Genetic sampling was conducted in 1994 and 1995; however, comparisons of allele frequencies between this stock and other lower Columbia steelhead stocks for determining stock distinctiveness are not very informative (Myers et al. 2002). An escapement goal of 1,486 fish has been established for this stock (SaSSI 2002).

2 Current Conditions

2.1 Current Population Status and Goals

The Grays River native winter steelhead population is documented in the LCRSRP. The WDFW SaSi 2002 report also indicates a native population with wild production. The 2002 report rated this stock status as “depressed” due to chronically low spawner escapements. Recently however, an increase in the number of wild spawners has been documented (2000 forward).

- **ESA Status:** This population is not listed.
- **Population Description:** Today a small but persistent run of wild winter steelhead returns to the Grays River. The precise distribution of the stock is not known, but the fish do penetrate high into the watershed and it is estimated that the escapement is between 400 and 600 fish annually (NPCC 2002).
- **Current Viability Rating:** Low, designated as a Primary population in the LCRSRP. A goal of High viability has been identified in recovery planning documents.
- **Recovery Goal for Abundance:** A viability goal of 600 adults was identified in the LCRSRP; an interim goal of 600 adults was also identified. The level of current escapement has averaged 727 adults (1991-2003 data). **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (from EDT):** Productivity 4.89; Capacity 1,126

2.2 Current Hatchery Programs Affecting this Population

Winter steelhead hatchery populations in the region that affect this population (e.g., through straying) are the Grays River Hatchery early winter steelhead program via the Elochoman Hatchery (Chambers Creek origin). Hatchery winter steelhead in the Grays River come from broodstock collected at the Elochoman Hatchery. Fry are transferred to Grays River for rearing and release (40,000 smolt program).

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program – from AHA summary –N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – from AHA summary--57

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 4.4 to 4.6. Average abundance of natural-origin spawners (NOS) would increase from 908 to 918. Harvest contribution of the natural and hatchery populations would go from 241 to 63.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations:

This unlisted population meets Primary standards and HSRG recommendations for pHOS. The system supports a small fishery and is meeting viability goals.

While the current program (40,000 smolts that come from Elochoman as fingerlings) is within HSRG guidelines for segregated programs, the HSRG notes that a unique opportunity exists to establish a “Wild Steelhead Management Zone” within the Grays River Basin.

Recommendations:

The existing program meets the standards for a Primary population.

The HSRG suggests that managers consider the ecological effect on this population. While these outplants do not appear to be having a genetic effect, considering Kostow’s data for summer steelhead, the HSRG urges caution (Kostow 2003, 2004, 2006).

Consideration should be given to converting this segregated program to an integrated program. A larger integrated program then could be implemented that still meets management parameters for a Primary population and would provide a harvest.

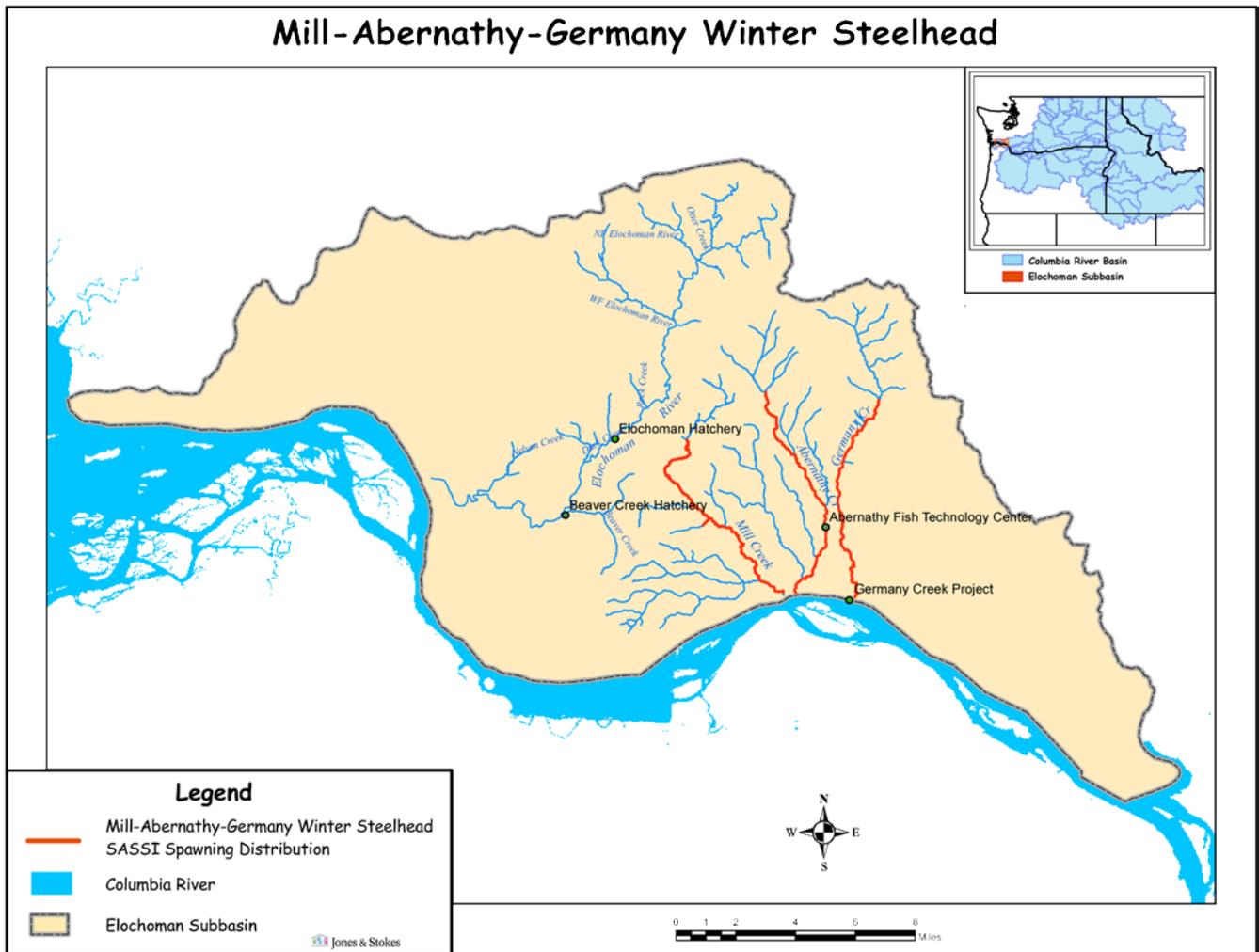
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Grays River Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 50% | 0% | 1% | 0.00 | 908 | 4.4 | 62 | 0 |
| | Seg Harv | 40.0 | 50% | | | | | | 179 | 56 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 918 | 4.6 | 63 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 884 | 4.2 | 60 | 0 |
| | Seg Harv | 40.0 | 0% | | | | | | 179 | 0 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 1,005 | 4.7 | 69 | 0 |
| | Seg Harv | 40.0 | 0% | | | | | | 179 | 0 |

Hatchery Scientific Review Group Review and Recommendations

Mill, Abernathy and Germany Creek Winter Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Mill, Abernathy and Germany Creek Winter Steelhead

Mill Creek winter steelhead were identified as a stock based on their distinct spawning distribution. Most spawning takes place in mainstem Mill Creek and the North Fork Mill Creek. Spawning also occurs in some unnamed tributaries. Spawning generally occurs from March to early June. No genetic analysis has been done on Mill Creek winter steelhead although it is known to be a native stock with wild production. There are no adequate abundance trend data available for Mill Creek winter steelhead, so their status was Unknown in 2002 (SaSSI 2002).

Abernathy Creek winter steelhead were identified as a stock based on their distinct spawning distribution. Most spawning takes place in Abernathy Creek and in tributaries such as Slide and Cameron creeks from March through early June. No genetic analysis has been done on Abernathy winter steelhead. This is a native stock with wild production. Stock status was rated Depressed in 2002 because of chronically low escapements. An escapement goal of 306 fish has been established for this stock. Escapements have been generally low, with an all-time low in 1996 of 16 fish (SaSSI 2002).

Germany Creek winter steelhead were identified as a stock based on their distinct spawning distribution. Spawning occurs in Germany Creek and in tributaries such as Loper and John creeks from March through early June. No genetic analysis has been done on Germany winter steelhead. This is a native stock with wild production, although the creek has been planted with hatchery winter steelhead since 1961. Stock from the Elochoman River, Chambers Creek and Cowlitz River have been used for these plants. WDFW considers that a native stock still exists because the non-native fish spawn much earlier than the native stock. Stock status was rated Depressed in 2002 because of chronically low escapements. An escapement goal of 202 fish has been established, although it has been met only twice, in 1993 and 2001.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Not listed
- Population Description: Primary
- Recovery Goal for Abundance: 600
- Productivity Improvement Expectation: 0%
- Habitat Productivity and Capacity (e.g., from EDT): Productivity: 5.06; Capacity: 691

2.2 Current Hatchery Programs Affecting this Population

No hatchery steelhead hatchery programs are operated in this watershed. Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program – from AHA summary: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – from AHA summary: 5

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain unchanged at 4.7. Average abundance of natural-origin spawners (NOS) would remain unchanged at 693. Harvest contribution of the natural and hatchery populations would remain unchanged at 40.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals. However, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated a Primary population that appears to be productive and abundant. There are no hatchery releases in Mill or Germany creeks.

An ongoing research project at the USFWS Abernathy Fish Technology Center annually releases 10,000 smolts from an integrated program into Abernathy Creek, but releases from this research project are scheduled to be terminated in 2014.

Recommendations

Monitor contribution of hatchery strays in spawning escapement.

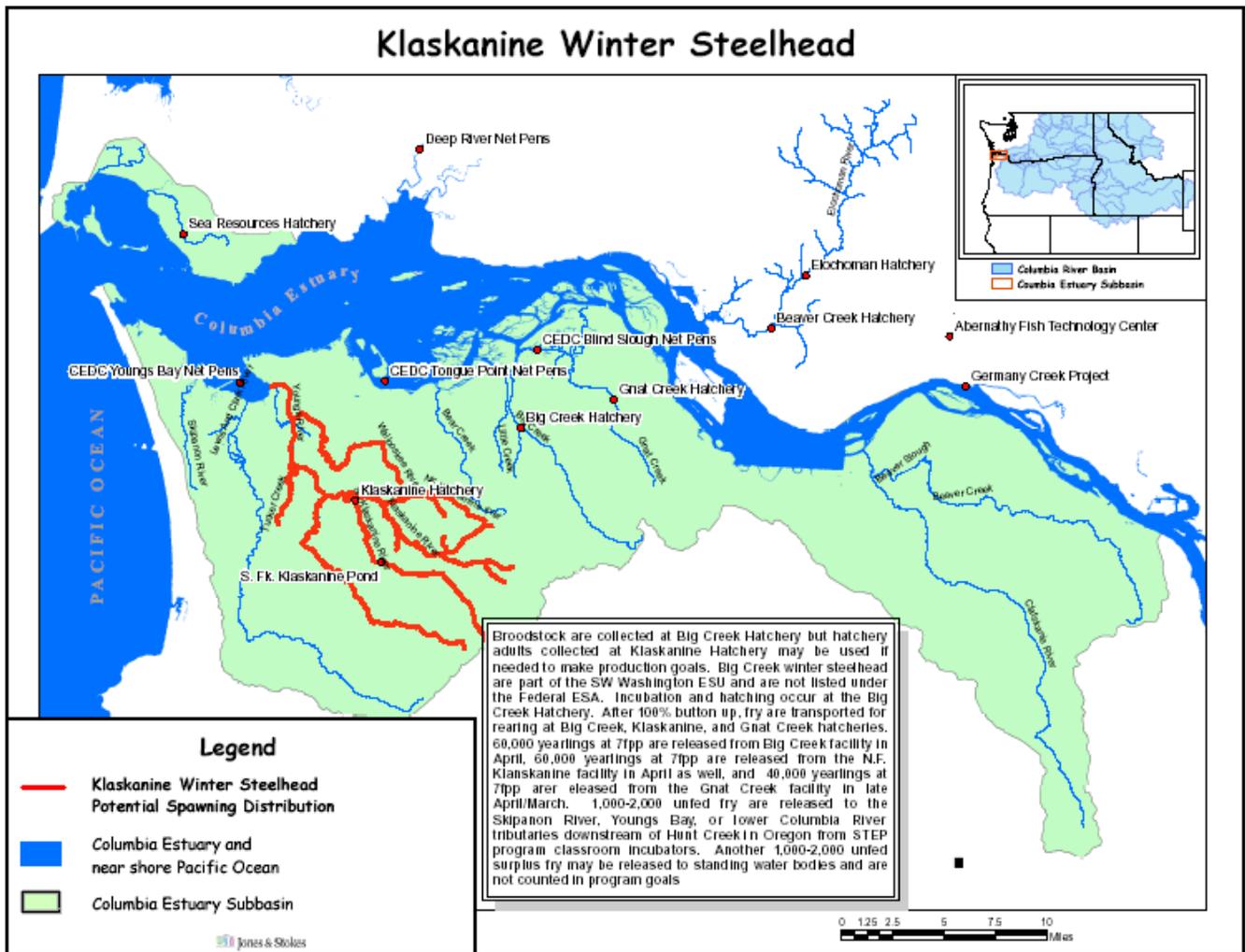
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Mill, Abernathy and Germany Creek Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 50% | 0% | 0% | 1.00 | 693 | 4.7 | 40 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 693 | 4.7 | 40 | - |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 690 | 4.7 | 40 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 777 | 5.2 | 45 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Youngs Bay Tributaries Winter Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Columbia Estuary-Youngs Bay Tributaries Winter Steelhead

The Klaskanine River is tributary to Youngs Bay near Astoria. The Klaskanine Hatchery is located on the North Fork Klaskanine River about 12 miles southeast of Astoria. A weir at the hatchery prevents passage further up the North Fork. Currently only unmarked steelhead are passed above the weir when the trap is being operated.

2 Current Conditions

2.1 Current Population Status and Goals

The HSRG has insufficient information about the steelhead population in the Youngs Bay subbasin and about the stray rate from this hatchery program.

- **ESA Status:** This population is not listed. Youngs Bay steelhead are part of the Southwest Washington Coast DPS.
- **Population Description:** Unknown
- **Current Viability Rating:** Likely Low
- **Recovery Goal for Abundance:** No goal established
- **Productivity Improvement Expectation:** With only unmarked steelhead being passed over the North Fork weir, significant improvements in productivity could be expected. However scale analysis is needed to determine if unmarked fish are really NORs or misidentified hatchery fish.
- **Habitat Productivity and Capacity:** Productivity: 3.0; Capacity: 200 assigned for this review.
- **Hatchery Populations of the Same Species that Affect this Population:** Steelhead released into the Klaskanine subbasin are Big Creek stock. No other steelhead are thought to be released into Youngs Bay tributaries so stray rates from other programs should be insignificant. Big Creek stock can affect local steelhead, if any, via genetic introgression and competition for food and space.
- **Populations Affected by this Hatchery Population Include:** Big Creek stock hatchery steelhead returning to Klaskanine Hatchery likely stray into other portions of the subbasin and could also enter other tributaries of Youngs Bay. Marked steelhead are harvested in Youngs and Lewis & Clark rivers, indicating that straying is occurring. As these steelhead are reared at Big Creek Hatchery, they could be expected to stray into Big Creek at unknown rates. When Big Creek broodstock returns are insufficient, adults from Klaskanine Hatchery are used as broodstock at Big Creek Hatchery. ESA-listed chum salmon fry could be affected by predation from steelhead smolts.

2.2 Current Hatchery Programs Affecting this Population

Annually 60,000 fingerlings at 14 fpp are transferred to Klaskanine Hatchery from Big Creek Hatchery. These fish are reared and then released at the hatchery in the spring at 7 fpp. Broodstock are of Big Creek origin.

- **PNI and pHOS Estimates (include straying from all hatchery programs):** pHOS is estimated at 17%.
- **Estimated Productivity (with harvest and fitness factor effects from AHA):** 1.36
- **Projected Average Natural Origin Escapement:** 51 adults

- Average Harvest Contribution: 425

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – 92 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.4 to 2.7. Average abundance of natural-origin spawners (NOS) would increase from approximately 51 to approximately 127. Harvest contribution of the natural and hatchery populations would go from 425 fish to approximately 13 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is considered a Stabilizing population. There is a 60,000 segregated winter steelhead smolt release in the North Fork of the Klaskanine River at the Klaskanine Hatchery. There is little steelhead habitat. The current program is satisfying management objectives.

The HSRG suggests that ODFW consider whether the Klaskanine watershed is capable or could be capable of supporting a natural-origin spawning population of steelhead. The existing hatchery program does not allow any significant production of natural-origin fish. Additional information is needed on stray rates into other portions of the Klaskanine River and tributaries of Youngs Bay. Natural smolt production in the North Fork Klaskanine above the weir should be estimated to confirm the low production capacity of the overall Klaskanine system.

Recommendations

The HSRG has no specific recommendations for this program.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Klaskanine Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 75% | 0% | 17% | 0.00 | 51 | 1.4 | 5 | 0 |
| | Seg Harv | 60.0 | 75% | | | | | | 420 | 288 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 127 | 2.7 | 13 | - |
| HSRG Solution | None None | - | 75% | 0% | 17% | 0.00 | 51 | 1.4 | 5 | 0 |
| | Seg Harv | 60.0 | 75% | | | | | | 420 | 288 |
| HSRG Solution w/ Improved Habitat | None None | - | 75% | 0% | 14% | 0.00 | 63 | 1.6 | 6 | 0 |
| | Seg Harv | 60.0 | 75% | | | | | | 420 | 288 |

1 Hood River Summer Steelhead

Steelhead return to the Hood River at 2 to 6 years of age, with most fish returning at age 4. Adults typically spend from 1–3 years in the ocean, with an average of 2 years. About 6 percent of returning steelhead adults are repeat spawners. Smolts range in age from 1- 3 years with most spending 2 years of their life in freshwater (E. Olsen 2003). Summer steelhead spawning is limited to the West Fork of the Hood River and occurs from February 15 to April 30. Outmigration extends from late March through July, peaking in early May. Screw trap data indicate that summer steelhead in the Hood River tend to remain and rear near their spawning reach and migrate from the West Fork in the spring (Hood Subbasin Plan 2004).

Winter and summer steelhead are native to the Hood River subbasin (Kostow 1995). The combined escapement for both winter and summer steelhead (excluding known hatchery fish) averaged around 1,000 fish during the 1950s and 1960s (Howell et al. 1985). Native summer steelhead escapement was 181 in 1997 and may have been as low as 80 in 1998 (Chilcote 1997). Winter steelhead are not found in the West Fork Hood River where Punchbowl Falls prevents them from ascending into this reach (Olsen et al. 1992).

An historic abundance of 243 steelhead was estimated for all of the small Oregon and Washington tributaries between Bonneville Dam and the Hood River (Myers et al. 2002). Carrying capacity in the watershed for steelhead is naturally limited by waterfalls and steep gradients close to the Columbia River (Hood Subbasin Plan 2006).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Hood Summer Steelhead are part of the Lower Columbia River Steelhead DPS which was listed as Threatened under the ESA in 2006.
- **Population Designation:** The Hood Summer Steelhead is designated as a Primary population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004).
- **Current Viability Rating:** The LCSR&SP describes current viability of the Hood Summer Steelhead as Unknown with a viability target of High.
- **Recovery Goal for Abundance:** A viability goal of 600 adults was identified in the LCSR&SP, and a potential abundance of 1,200 adults was identified. Current abundance is rated at 154 adults.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity (from EDT):** Productivity: 2.0; Capacity: 600.

2.2 Current Hatchery Programs Affecting this Population

The Hood River summer steelhead supplementation project, contained within the Hood River Production Program, began in 1998 with wild summer steelhead adults collected at the Powerdale Fish Facility (RM 4.0). The broad run and spawn timing for these summer steelhead, coupled with the very small wild population size, has made the initial brood collection and successful spawning for this stock very challenging (HGMP 2000).

The factors limiting supplementation in the Hood Basin are small wild populations and new broodstocks that must consist substantially of wild fish. There is also a limit on the take of wild fish for broodstock. These factors produce very small broodstocks that introduce potential random deviation from the phenotypic distributions of the wild fish (HGMP 2000).

Steelhead broodstock are collected at the Powerdale Fish Facility, located at RM 4.0 on the Hood River. Construction of this facility was completed in 1997. Fish are captured after they ascend a fish ladder and jump over a finger weir into an 8x50-foot channel. Fish are manually crowded into a fish lift where they are brought into the sorting and processing building. Fish are routed into an anesthetic tank prior to any handling. Those selected for broodstock are loaded into a portable fish transportation tank while still anesthetized (HGMP 2000).

Summer Steelhead broodstock numbers collected for 1998, 1999, and 2000 were 9, 25, and 22, respectively. All of the collected brood were wild fish volunteering to the Powerdale fish trap (HGMP 2000). In 2003 and 2004, 40 and 38 fish were collected, respectively (Parkdale Fish Facility Annual Report 2004). Green eggs are currently being transferred to Oak Springs Hatchery on the Deschutes River for hatching and rearing to smolt stage. Smolts are trucked to two acclimation site in the West Fork of the Hood River in early April at ~5.7 fpp. The smolts are allowed to acclimate and volitionally migrate until mid-May. Any non-migrants are collected and trucked to lower ¼ mile of the Hood River for release. In 1999, 19,513 smolts were released (HGMP 2000).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 128 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 22 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.3 to 1.6. Average abundance of natural-origin spawners (NOS) would decrease from approximately 210 fish to approximately 191 fish. Harvest contribution of the natural and hatchery populations would go from approximately 580 fish to approximately 31 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population has been designated as a Primary population. There has been a long-term hatchery influence in this basin. Habitat productivity and capacity are limiting natural production of steelhead. There is currently a 30,000 smolt integrated conservation program operating in the basin as well as a 30,000 smolt segregated summer steelhead program (South Santiam stock) which is planned to be phased out. The effectiveness of the integrated conservation program is currently being studied. Due to low productivity of the habitat and reduced fitness (due to past hatchery influence) of the current population, it is unclear if the population would persist without support of the integrated conservation program.

Until significant habitat improvement occurs, the integrated conservation program will continue to play an important role in maintaining the genetic legacy of this population. In order to contribute to recovery as a Primary population, significant habitat improvements would be required.

Broodstock management and experimental objectives require maintaining the current capabilities afforded by the Powerdale weir. The managers correctly recognized that the segregated South Santiam stock smolt release is not possible without effective segregation of hatchery fish at the Powerdale facility.

The HSRG noted a general concern about the recycling of summer steelhead through the lower river fishery and strays from this practice resulting from little additional harvest.

The HSRG has general concerns with the practice of transferring fish between basins because of the risk of pathogen transfer (and stress) and straying. Rearing facilities in the Hood River would require an undefined warm water source to achieve growth sufficient to release a 1-year age smolt.

The HSRG had questions about survival effects of marking methods chosen to uniquely identify hatchery steelhead and considerations made when making this decision.

Broodstock management (i.e., composition of hatchery- and natural-origin fish on the spawning grounds and in the hatchery) is an important prerequisite to meet conservation goals for salmon and steelhead. This integrated program meets the standards for a Primary population with respect to PNI. The ability to

control and monitor natural and hatchery escapement in the lower river is critical to continue to achieve this standard.

Removal of Powerdale Dam in 2010 will eliminate lower river broodstock collection and the means to precisely manage spawning composition for spring Chinook, and summer and winter steelhead. Alternate weir sites are proposed in the tributaries of the Hood River to collect broodstock and manage spawning composition, but it appears that they would have much lower efficiency and precision than the existing facility and location. The existing facilities are cost effective in terms of capital, operating, and monitoring costs and efficiency.

Recommendations

Continue the program as currently operated; however, the research objectives and evaluation program depend on the continued operation of the Powerdale facility.

We recommend managers use other marking methods (body tags, elastomer tags, etc.) that may have less of an effect on survival.

If the South Santiam stock summer steelhead program were continued, we recommend discontinuing recycling adults through the lower river.

The HSRG believes that the best biological solution for broodstock management is at a single location in the lower river rather than multiple sites higher in the watershed. The HSRG recommends that managers consider the biological advantages of the location. Specific points to consider include the potential to operate a fish friendly collection facility, sample the entire returning fish population, and continue monitoring and evaluation activities at a site proven to be reliable.

A weir structure at the Powerdale location would continue to provide value to overall stock management through the ability to: 1) collect broodstock, 2) evaluate life cycle productivity, 3) monitor hatchery fish reproductive success (maintaining the pedigree study), and 4) remove hatchery strays. The HSRG recognizes that any decision regarding the future of facilities and operations at the Powerdale location must consider potential downstream passage issues for juvenile salmonids, ecological effects of the dam and other priorities in the watershed.

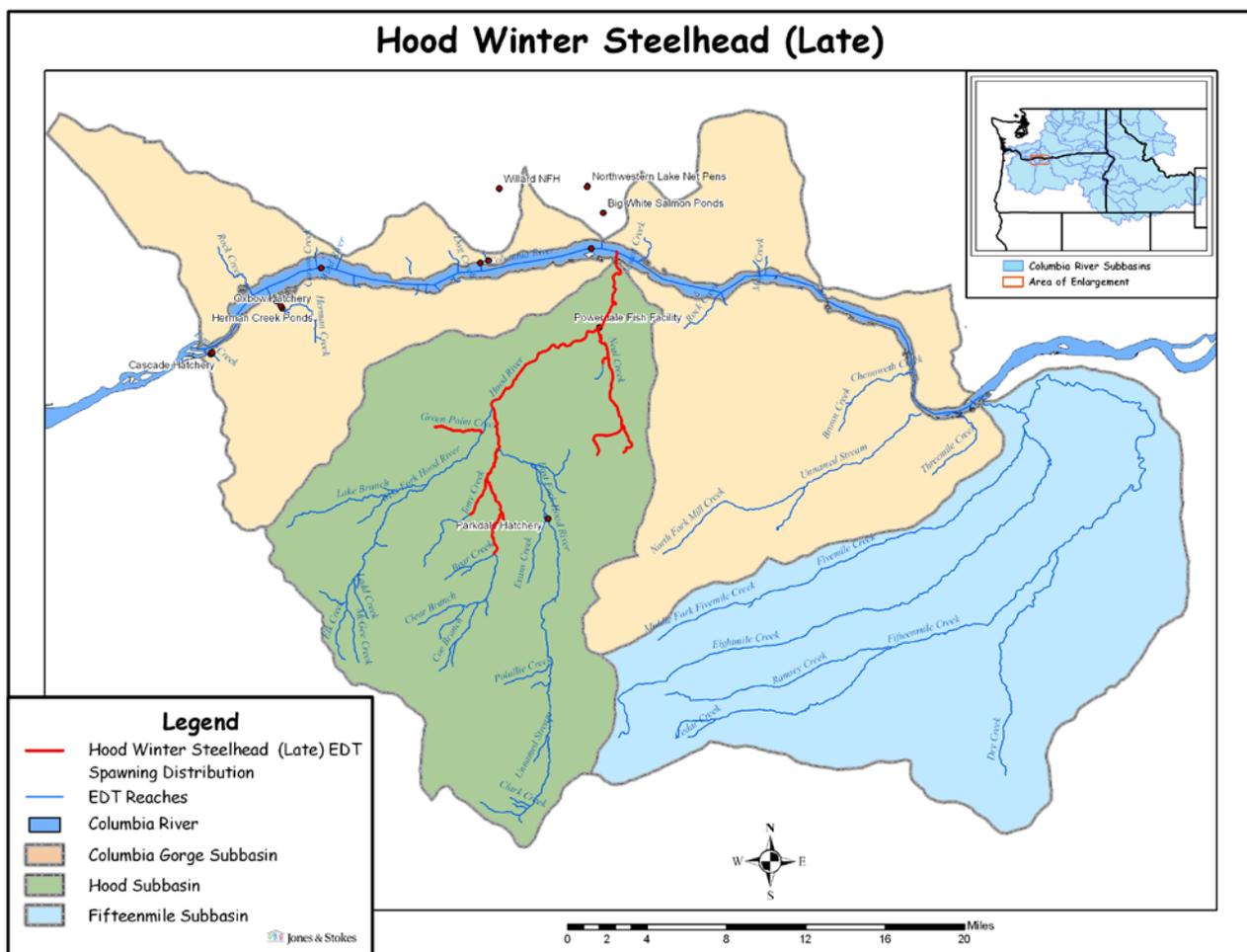
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Hood River Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 31.4 | 70% | 0% | 35% | 0.74 | 210 | 1.3 | 308 | 299 |
| | Seg Harv | 31.5 | 95% | | | | | | 272 | 407 |
| No Hatchery | Int Cons | - | 0% | 0% | 0% | 1.00 | 191 | 1.6 | 31 | - |
| HSRG Solution | Int Cons | 31.4 | 50% | 0% | 44% | 0.70 | 232 | 1.3 | 312 | 214 |
| | Seg Harv | - | 0% | | | | | | - | - |
| HSRG Solution w/ Improved Habitat | Int Cons | 31.4 | 50% | 0% | 40% | 0.72 | 275 | 1.5 | 319 | 214 |
| | Seg Harv | - | 0% | | | | | | - | - |

Hatchery Scientific Review Group Review and Recommendations

Hood River Winter Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Hood River Winter Steelhead

Steelhead return to the Hood River at 2 to 6 years of age, with most fish returning at age 4. Adults typically spend from 1 to 3 years in the ocean, with an average of 2 years. About 6% of returning steelhead adults are repeat spawners. Smolts range in age from 1 to 3 years with most spending 2 years of their life in freshwater (E. Olsen 2003). Escapement to the Powerdale Dam trap ranged from 206 to 1,017 wild, 108 to 917 Hood River stock subbasin hatchery, and 1 to 38 stray hatchery winter steelhead for the 1991-1992 through 2000-2001 run years (E. Olsen 2003).

Winter steelhead spawn primarily in the Hood River mainstem, Middle Fork, and East Fork. Winter steelhead are not found in the West Fork Hood River because Punchbowl Falls prevents their access (Olsen et al. 1992). Spawning occurs from February 15 to June 15. The median spawning period for winter steelhead is about two weeks later than for summer steelhead.

A substantial increase in smolt to adult survival is expected as a result of the Powerdale hydropower project ceasing to divert flow from the river (personal communication, ODFW, August 2007). Diversion during spring out-migration was eliminated in 2004. Diversion was eliminated year round in the fall of 2006 when debris torrents damaged the diversion channel and penstocks.

Winter and summer steelhead are native to the Hood River subbasin (Kostow 1995). The combined escapement for both winter and summer steelhead (excluding known hatchery fish) averaged around 1,000 fish during the 1950s and 1960s (Howell et al. 1985). Native summer steelhead escapement was 181 in 1997 and may have been as low as 80 in 1998 (Chilcote 1997).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Hood Winter Steelhead are part of the Lower Columbia River Steelhead DPS which was listed as Threatened under the ESA in 2006.
- **Population Designation:** The Hood Winter Steelhead is designated as a Primary population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP, 2004).
- **Current Viability Rating:** The LCSR&SP describes current viability of the Hood Winter Steelhead as Unknown with a viability target of High.
- **Recovery Goal for Abundance:** A viability goal of 1,400 adults was identified in the LCSR&SP, and a potential abundance of 2,800 adults was identified. Current abundance is 436 adults.
- **Productivity Improvement Expectation:** Unknown.
- **Habitat Productivity and Capacity (from EDT):** Productivity: 2.0; Capacity: 2,345

2.2 Current Hatchery Programs Affecting this Population

The Hood River winter steelhead supplementation project, contained within the Hood River Production Program, began in 1991 with an angler broodstock collection program for wild winter

steelhead from the lower mainstem Hood River. Beginning in 1992, all Hood River winter steelhead broodstock were collected from wild Hood River stock captured at the Powerdale Fish Facility (RM 4.0). Broodstock collection by angling was not very successful. The Powerdale facility was more effective. Each year since 1992, broodstock has been sub-sampled from throughout the Hood River wild winter steelhead run, which passes the dam en route to the natural spawning areas above the dam. All fish passing the dam are collected in the trap. Candidates for broodstock are selected randomly throughout the run. Broodstock guidelines call for collecting no more than 25% of the run for broodstock needs. The broodstock consists of 100% natural origin fish; no hatchery origin adults are used.

The factors limiting supplementation in the Hood River subbasin are small wild populations and new broodstocks that must consist substantially of wild fish. There is also a limit on the take of wild fish for broodstock. These factors produce very small broodstocks that introduce potential random deviation from the phenotypic distributions of the wild fish (HGMP 2000).

Construction of the improved Powerdale fish collection facility was completed in 1997. Fish are captured after they ascend a fish ladder and jump over a finger weir into an 8- by 50-foot channel. Fish are manually crowded into a fish lift where they are brought into the sorting and processing building. From here they are routed into an anesthetic tank prior to any handling. Those selected for broodstock are loaded into a portable fish transportation tank while still anesthetized (HGMP 2000).

Winter steelhead broodstock collected in 1998, 1999, and 2000 numbered 41, 61, and 40 respectively. All of the collected brood were wild fish volunteering to the Powerdale fish trap (HGMP 2000). A total of 82 adults were collected for brood in 2004 (Parkdale Fish facility annual Report 2004). Green eggs are currently being transferred to Oak Springs Hatchery on the Deschutes River for hatching and rearing to smolt stage. Planned smolt releases are 25,000 in the Middle Fork Hood River at the Parkdale facility and 25,000 into the East Fork Hood River using portable acclimation tanks. Actual release levels averaged 43,000 yearlings (range 4,200-61,000) from 1993 to 1999. Releases are trucked from Oak Springs Hatchery to sites on the East Fork Hood and Middle Fork Hood for acclimation in early April at ~5-6 fpp. The smolts are allowed to acclimate and volitionally migrate until mid-May. Any non-migrants are collected and trucked to lower ¼ mile of the Hood River for release.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 438 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 1 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly

greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.4 to 1.6. Average abundance of natural-origin spawners (NOS) would decrease from approximately 866 to approximately 736. Harvest contribution of the natural and hatchery populations would go from approximately 485 fish to approximately 123 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population has been designated as a Primary population. There has been a long-term hatchery influence in this basin. There is currently an integrated conservation program releasing 50,000 smolts operating in the basin. The effectiveness of this program is currently being studied. This population could contribute to recovery as a Primary population.

The purpose of the hatchery program is to meet important research objectives and contribute to harvest and conservation goals. The integrated hatchery program is operated consistent with the standards for a Primary population. Broodstock management and experimental objectives require maintaining the current capabilities afforded by the Powerdale weir.

The HSRG has concerns with the potential for pathogen transfer (and stress) and straying associated with the practice of incubating and rearing fish outside of the Hood River subbasin.

Rearing facilities in the Hood River would require an undefined warm water source to achieve a one-year-old smolt release.

The HSRG had questions about survival effects of marking methods chosen to uniquely identify hatchery steelhead and considerations made when making this decision.

Recommendations

The recommendation is to continue the program as currently operated; however, the research objectives and evaluation program depend on the continued operation of the Powerdale facility.

The preferred solution for broodstock management and continued research would be to maintain a single weir location in the lower river rather than multiple sites higher in the watershed. Specific points to consider include the potential to operate a fish friendly collection facility, sample the entire returning fish population, and continue monitoring and evaluation activities at a site proven to be reliable.

A weir structure at the Powerdale location would continue to provide value to overall stock management through the ability to: 1) collect broodstock, 2) evaluate life cycle productivity, 3) monitor hatchery fish reproductive success (maintaining the pedigree study), and 4) remove hatchery strays. The HSRG recognizes that any decision regarding the future of facilities and operations at the Powerdale location must consider potential downstream passage issues for juvenile salmonids, ecological effects of the dam and other priorities in the watershed.

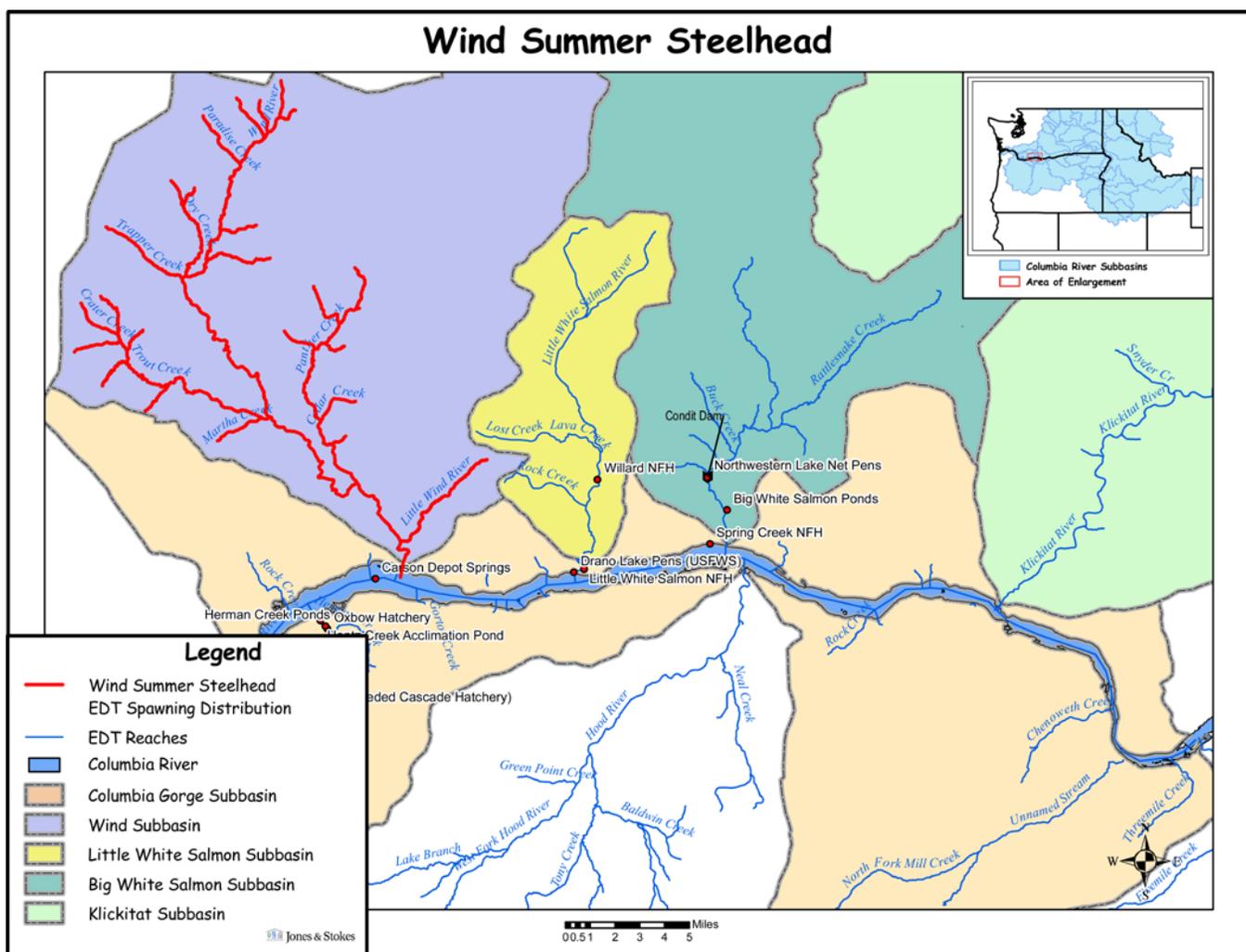
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Hood River Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 49.2 | 0% | 0% | 29% | 0.78 | 866 | 1.4 | 485 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 736 | 1.6 | 123 | - |
| HSRG Solution | Int Cons | 49.2 | 0% | 0% | 29% | 0.78 | 867 | 1.4 | 485 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 49.2 | 0% | 0% | 25% | 0.80 | 1,045 | 1.6 | 515 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Wind River Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Wind River Summer Steelhead

Summer steelhead spawning occurs throughout the Wind River basin including the mainstem Wind, the Little Wind River (RM 1.1), Panther Creek (RM 4.3), Bear Creek (RM 4.3), Trout Creek (RM 10.8), Trapper Creek (RM 18.9), Dry Creek (RM 19.1), and Paradise Creek (RM 25.1) (LCFRB 2004). High drop-offs and waterfalls exist throughout the basin; some have been modified to promote fish passage while others remain as impediments to upstream steelhead migration. Shipherd Falls, a 40-foot cascade at RM 2.1 on the mainstem, was laddered in 1956, allowing anadromous fish passage to the upper basin. Construction of Bonneville Dam inundated the lower one mile of river, flooding spawning and rearing habitat (LCFRB 2004).

Wind River summer steelhead stock (including Panther and Trout creeks) has a distinct spawning distribution and early run timing. Allozyme analyses clustered mainstem Wind River and Panther Creek summer steelhead with a number of lower Columbia summer and winter steelhead stocks, including Skamania Hatchery summer steelhead; Trout Creek summer steelhead were part of an outlier group that included SF Nooksack summer steelhead, Washougal steelhead, and Cowlitz native late winter steelhead (LCFRB 2004).

Prior to 1950, the Wind River adult population was estimated to be 2,500-5,000 fish. Trout Creek escapement was estimated at over 100 wild summer steelhead in the 1980s but declined to less than 30 fish in the 1990s. Current natural spawning returns range from 100-800 fish. Snorkel index adult counts from 1989-2000 ranged from 26 to 274. The escapement goal for the Wind River basin is 957 wild adult steelhead.

The NMFS Status Assessment indicated a 0.0 risk of 90% decline in 25 years and a 0.91 risk of 90% decline in 50 years; the risk of extinction in 50 years was 0.0. The smolt density model estimated potential summer steelhead smolt production for the Wind River basin was 62,273. Wild steelhead smolt yield has been monitored in the Wind River basin since 1995; the trend indicates increasing smolt yield. WDFW indicated that natural production in the watershed is primarily sustained by wild fish.

Adult migration timing for Wind River summer steelhead extends from May through November. Spawning timing in the Wind River basin is generally from early March through May. Limited age class data indicate that the dominant age class is 2.2 and 2.3 (58% and 26%, respectively). Wild steelhead fry emerge from April through July; juveniles generally rear in fresh water for two years; juvenile emigration occurs from April to May, with peak migration in early May (LCFRB 2004).

Based on EDT analysis, summer steelhead productivity and abundance has declined by 75% and 68%, respectively (LCFRB 2004). Summer steelhead smolt abundance has decreased 40% from historical levels.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Wind River summer Steelhead are part of the Lower Columbia Steelhead DPS which was listed as Threatened under the ESA in 1998.

- Population Description: The Wind River summer steelhead population is designated as a Primary population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The current status of the Wind River population is near viable levels (Med+) and has the highest current summer steelhead viability status rating. The SASSI status of this stock in 2002 was Depressed (LCFRB 2004).
- Recovery Goal for Abundance: 1,000
- Productivity Improvement Expectation: unknown
- Habitat Productivity and Capacity (e.g., from EDT): Productivity: 4.8; Capacity: 1,877.

2.2 Current Hatchery Programs Affecting this Population

- There are no hatchery programs within the subbasin. Summer steelhead hatchery releases began in the basin in 1960; releases were suspended in the early 1980s to allow wild steelhead management, then reinstated in the mid-1980s. Releases of catchable rainbow trout were discontinued in 1994 and hatchery steelhead releases were discontinued in 1997 (LCFRB 2004).
- A few marked hatchery summer steelhead avoid the fish ladder and trap and pass upstream of Shipherd Falls; however, hatchery steelhead are thought to make up less than 1% of the natural spawning population (personal communication, D. Rawding, WDFW).
- Only unmarked summer steelhead are allowed to pass Hemlock Dam and access the upper watershed of Trout Creek.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 1 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain at 3.6. Average abundance of natural origin spawners (NOS) would remain at approximately 1,140. Harvest contribution of the natural and hatchery populations would stay at approximately 380.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The recovery abundance objectives are to return 1,000 fish to the Wind River subbasin; the habitat capacity is estimated to be over 1,800 fish. The population is currently being managed for natural fish production and has no steelhead hatchery program.

There may be an unexplained loss of steelhead above Bonneville Dam based on monitoring of Hood River steelhead populations. It is unknown if this is also affecting the Wind River population.

Recommendations

Given the primary designation of this population, if the number of fish returning to the Wind River subbasin is consistently less than 250 fish, managers might consider implementing an integrated conservation program with a sunset clause.

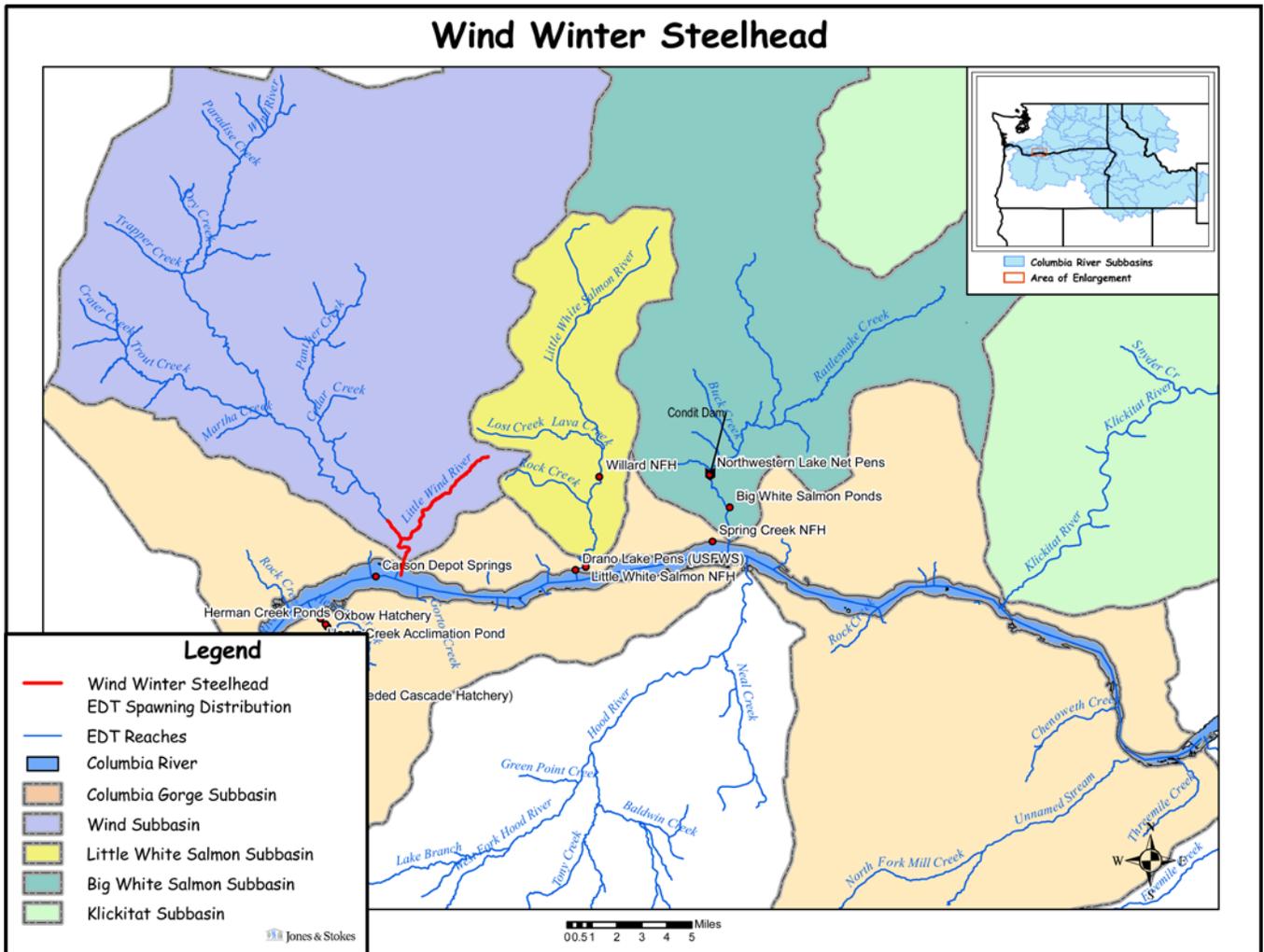
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Wind River Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 95% | 0% | 1.00 | 1,139 | 3.6 | 380 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 95% | 0% | 1.00 | 1,140 | 3.6 | 380 | - |
| HSRG Solution | None None | - | 0% | 95% | 0% | 1.00 | 1,139 | 3.6 | 380 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 95% | 0% | 1.00 | 1,298 | 4.0 | 433 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Wind River Winter Steelhead (Late) Population and Related Hatchery Programs

January 31, 2009



1 Wind River Winter Steelhead

A small naturally-produced winter steelhead population occurs in the Wind River. This population is subject to Bonneville Dam passage concerns. Habitat potential is limited for this very small population that is near the upstream limits of winter steelhead distribution in the Columbia River Basin.

The historical Wind River adult population is estimated at 300 to 2,500 fish. Current natural spawning returns are about 100 fish. Shipherd Falls (Rm 2.1) blocked winter steelhead until 1956 when a fish ladder was constructed. Spawning occurs in the mainstem to RM 11 and in Trout Creek from early March to early June. Juvenile rearing occurs both downstream and upstream of the spawning areas. Juveniles rear for a full year or more before migrating from the Wind River subbasin.

Winter steelhead are distributed throughout the lower mainstem Wind River (~11 mi) and Trout Creek (RM 10.8). Most winter steelhead spawn in the mainstem Wind River below Shipherd Falls and in the Little Wind River (a tributary below Shipherd Falls).

High drop-offs and waterfalls exist throughout the subbasin; some have been modified to promote fish passage while others remain as impediments to upstream steelhead migration. Shipherd Falls (a 40-foot cascade), located at RM 2.1 on the mainstem, was laddered in 1956, allowing anadromous fish passage to the upper basin. Construction of Bonneville Dam inundated the lower one mile of river, flooding spawning and rearing habitat.

Adult migration timing for Wind River winter steelhead is from December through April. Spawning timing on the Wind is generally from early March to early June. Age composition data for Wind River winter steelhead are not available. Wild steelhead fry emerge from March through May; juveniles generally rear in fresh water for two years; juvenile emigration occurs from April to May, with peak migration in early May.

Wind River winter steelhead stock is designated based on distinct spawning distribution and run timing. Wild stock interbreeding with Chambers Creek Hatchery brood stock may have occurred but is assumed to be minimal.

In 1936, steelhead were observed in the Wind River during escapement surveys. Trout Creek escapement was estimated at over 100 wild steelhead in the 1980s but declined to less than 30 fish in the 1990s. Wild winter steelhead escapement estimates for the Wind River are not available.

Wild steelhead smolt yield has been monitored in the Wind River subbasin since 1995; the trend indicates increasing smolt yield in recent years. WDFW indicated that natural production in the watershed is primarily sustained by wild fish.

The Wind River winter steelhead population was modeled using EDT. Historic adult abundance and productivity has decreased by 75% and 83%, respectively. Smolt abundance has declined by 56%.

The EDT output was compared to smolt trap data and adult escapement. The Wind River smolt dataset compared favorably with the EDT output, but the adult dataset does not. This is due to the relatively recent adult dataset, which was collected primarily during an unproductive ocean regime during the late 1980s and 1990s. Recent returns, which are not included in the dataset

because the full brood year has not returned, indicate the new spawner recruit data will fall at or above the EDT line (D. Rawding 2004 in Recovery Plan Appendix E 2004).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Wind River Winter Steelhead are part of the Lower Columbia Steelhead ESU which was listed as Threatened under the ESA in 1998.
- Population Description: The Wind River Winter Steelhead population is designated as a Stabilizing population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes current viability as Low+ with a viability goal of Low+.
- Recovery Goal for Abundance: 50
- Productivity Improvement Expectation: unknown
- Habitat Productivity and Capacity (e.g., from EDT): Productivity: 3.4, Capacity: 94

2.2 Current Hatchery Programs Affecting this Population

- There are no hatchery programs in the subbasin. Winter steelhead were released annually in the basin until 1997, ranging from 2,500 to 10,000 smolts. Winter steelhead releases into the Wind River subbasin came from Chambers Creek and Skamania Hatchery stocks. Steelhead releases were discontinued to promote wild steelhead management in the basin (LCFRB 2004).
- A few marked hatchery winter steelhead avoid the fish ladder and trap and pass upstream of Shipherd Falls. It is not known how many hatchery winter steelhead spawn below Shipherd Falls and in Little Wind River.
- Only unmarked winter steelhead have been allowed to pass Hemlock Dam and access the upper watershed of Trout Creek.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: None

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions

not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain unchanged at 2.6. Average abundance of natural-origin spawners (NOS) would remain unchanged at 149. Harvest contribution of the natural and hatchery populations would remain unchanged at 21.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Recommendations

No specific recommendations were offered for this population.

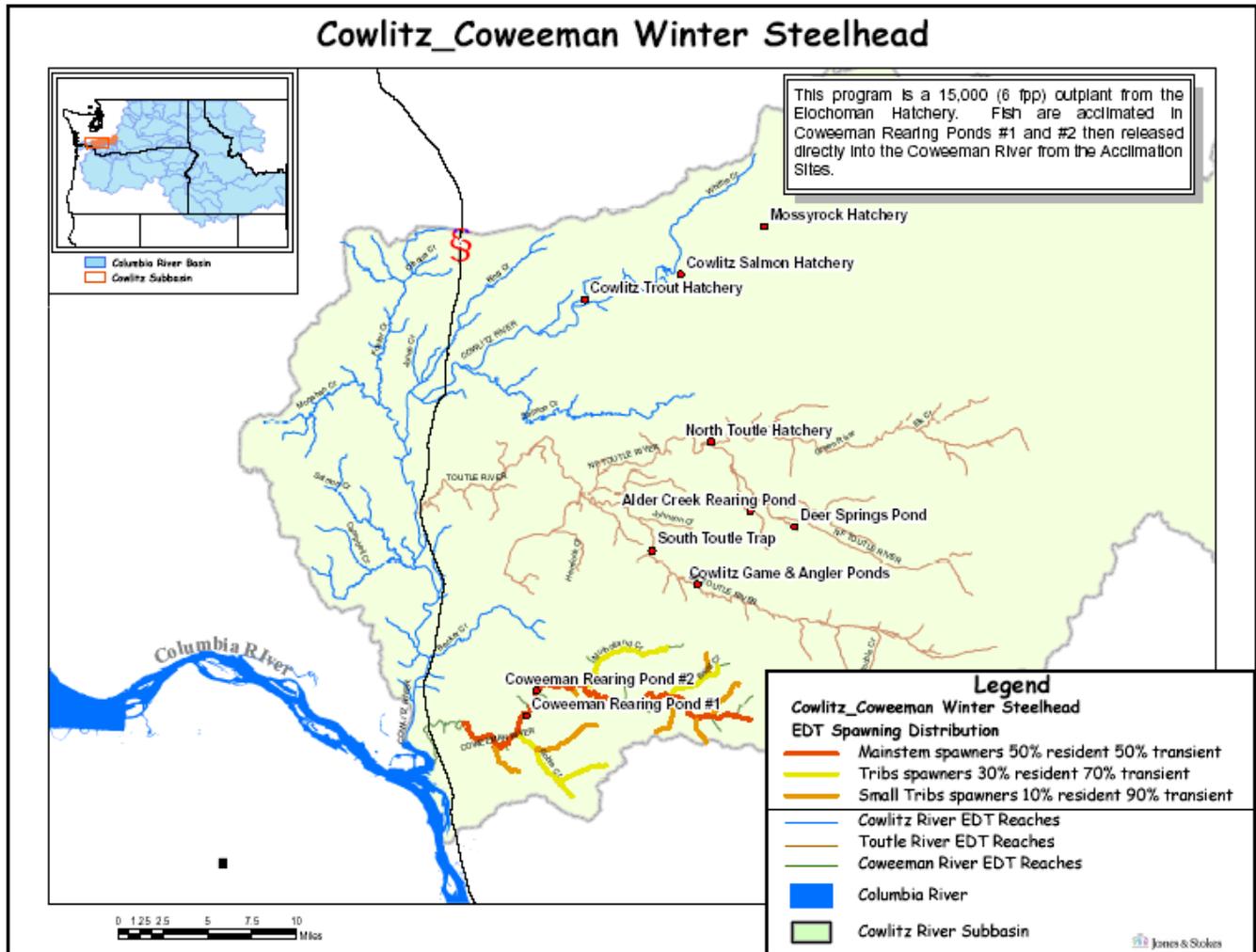
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Wind Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 149 | 2.6 | 21 | - |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 149 | 2.6 | 21 | - |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 149 | 2.6 | 21 | - |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 174 | 2.9 | 25 | - |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Coweeman River Winter Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Coweeman River Winter Steelhead

Stock status was rated Depressed in 2002 because of chronically low escapements. An escapement goal of 1,064 fish has been established for this stock. This stock has had consistently low escapement estimates since 1989, with an all-time low escapement of 44 fish in 1996.

Coweeman winter steelhead were identified as a stock based on their distinct spawning distribution. Most spawning takes place from March through early June in the mainstem Coweeman River and in tributaries such as Mulholland and Gobble creeks. No genetic analysis has been done on Coweeman winter steelhead.

This is a native stock with wild production. The Coweeman River has been planted with hatchery winter steelhead since 1957. Most of the releases were Chambers Creek Hatchery winter steelhead stock, whose spawning peak occurs almost three months prior to the spawning peak of the native stock. It is not believed that significant hybridization has occurred between the Chambers Creek stock and the native stock (SaSSI, 2002).

2 Current Conditions

2.1 Current Population Status and Goals

This program conflicts with conservation of the native steelhead which are ESA-listed as a threatened species.

- ESA Status: Coweeman winter steelhead are listed as threatened and the population is part of the Lower Columbia River Steelhead DPS.
- Population Description: Primary
- Current Viability Rating: Low
- Recovery Goal for Abundance: 500
- Productivity Improvement Expectation: 25%

Habitat Productivity and Capacity (from EDT): Productivity: 3.34; Capacity: 609

2.2 Current Hatchery Programs Affecting this Population

This program currently releases 15,000-20,000 marked steelhead smolts. Broodstock are obtained from Elochoman Hatchery and are early stock steelhead (originally Chambers Creek stock). There is no means to collect returning hatchery-origin adults that are not harvested.

PNI and pHOS Estimates (include straying from all hatchery programs): None; this is a segregated program.

- Estimated Productivity (with harvest and fitness factor effects from AHA): 2.7
- Projected Average Natural Origin Escapement: 468
- Average Harvest Contribution: 159 adults
- Hatchery strays from in-basin integrated hatchery program – from AHA summary: N/A

Hatchery strays from in-basin segregated and out-of-basin hatchery programs – from AHA summary: 81

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.7 to 3.1. Average abundance of natural-origin spawners (NOS) would increase from 467 to 541. Harvest contribution of the natural and hatchery populations would go from 159 to 31.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Coweeman winter steelhead are listed as a Primary population for recovery and are affected directly by fish from one segregated hatchery steelhead program. Annually, 15,000- 20,000 “early run” steelhead smolts are outplanted from the Elochoman Hatchery into the Coweeman River after receiving brief acclimation within the watershed. This population meets Primary standards and HSRG recommendations for pHOS; however, the HSRG noted the ecological effect of these fish on an ESA-listed species. While these outplants do not appear to be having a genetic effect, considering Kostow’s data for summer steelhead, the HSRG urges caution (Kostow 2003, 2004, 2006).

Recommendations

Consideration should be given to either eliminating the current segregated program and designating this stream a “Wild Steelhead Management Zone”, or developing an integrated program. A larger integrated program could be implemented and still meet HSRG standards for a Primary population. This would require facilities to capture natural brood.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Coweeman Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

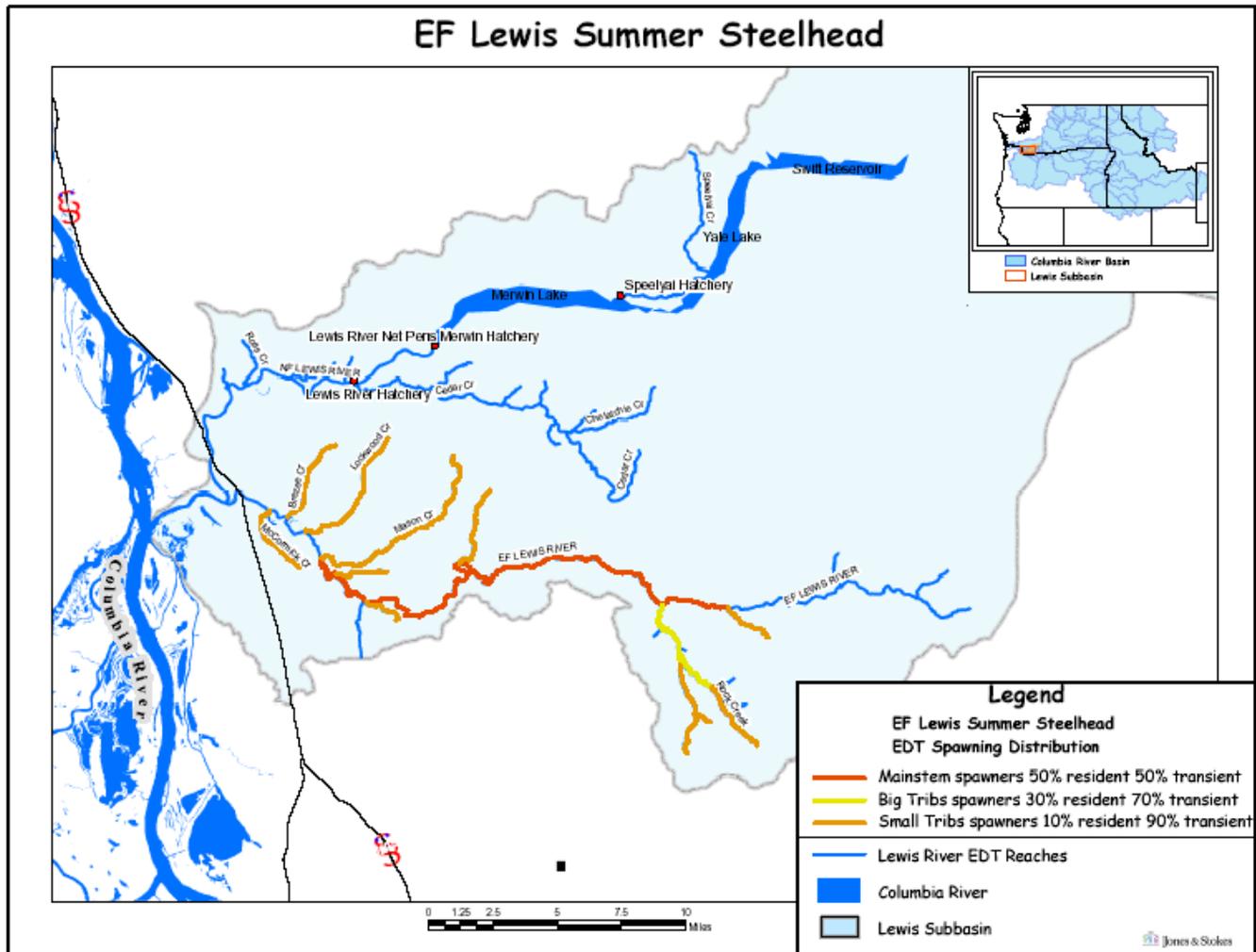
| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 2% | 0.00 | 467 | 2.7 | 27 | 0 |
| | Seg Harv | 20.2 | 0% | | | | | | 132 | 0 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 541 | 3.1 | 31 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 511 | 2.8 | 30 | 0 |
| | Seg Harv | 22.1 | 0% | | | | | | 72 | 1 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 602 | 3.2 | 35 | 0 |
| | Seg Harv | 22.1 | 0% | | | | | | 72 | 1 |

Note: Segregated hatchery fish are early-timed Elochoman Winter Steelhead released into the Coweeman.

Hatchery Scientific Review Group Review and Recommendations

East Fork Lewis River Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 East Fork Lewis River Summer Steelhead

East Fork Lewis summer steelhead were identified as a stock based on their distinct spawning distribution and early run timing. Spawning takes place in the East Fork Lewis River and its tributaries such as Kings, Copper and McKinley creeks. It generally occurs from early March through early June (SaSI 2002). While information concerning spawning areas on the East Fork Lewis River is scarce, approximately 12 percent of spawning occurs in the headwaters and upper tributaries above Sunset Falls. Hatchery summer and winter steelhead have been planted since 1964. Due to a lack of survey information, the status of the summer stock is unknown (WDFW 2002), although available data suggests the stock is depressed.

The escapement goal for summer steelhead in the East Fork is 512 (Governor's Joint Natural Resources Cabinet 1998). Mid-July snorkel counts have been conducted for this population since 1995. Recently, these counts have been calibrated by mark-recapture studies to allow for escapement estimates. Results (extrapolated from snorkel counts) indicate an escapement of between 141 and 910 adults from 1995 and 2003 (average 329) with increases in recent years. WDFW has established an escapement goal of 814 fish for this stock.

Genetic sampling was conducted in 1996; however, comparisons of allele frequencies between this stock and other lower Columbia steelhead stocks for determining stock distinctiveness are not very informative (Myers et al. 2002).

2 Current Conditions

2.1 Current Population Status and Goals

The East Fork Lewis River native summer steelhead population is documented in the Lower Columbia River Salmon Recovery Plan ESA Status. This population is listed as threatened and is part of the Lower Columbia River DPS.

- Population Description: Primary
- Current Viability Rating: Very Low
- Recovery Goal for Abundance: 200 adults
- Productivity Improvement Expectation: Unknown

Habitat Productivity and Capacity (from EDT): Productivity: 3.0; Capacity: 700

2.2 Current Hatchery Programs Affecting this Population

Steelhead smolts (30,000) are planted without acclimation at the upper end of Lewisville Park (RKm 24) and at Daybreak Park (RKm 17) on the East Fork Lewis River. Broodstock are trapped and all fish rearing takes place at Skamania Hatchery. Broodstock originate from Skamania summer steelhead (Washougal subbasin). In addition, a 90,000 smolt hatchery winter steelhead direct plant (of Skamania origin) also takes place.

Estimated number of hatchery stray as affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 97

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.9 to 2.8. Average abundance of natural origin spawners (NOS) would increase from 392 to 599. Harvest contribution of the natural and hatchery populations would go from 251 to 35.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is a Primary population. Based on recently collected mark-recapture estimates, the capacity values of this primary population should be about 700 fish (WDFW SaSI). There are no adult collection facilities on the East Fork Lewis. Two segregated hatchery steelhead programs affect this population: a 90,000 early winter smolt release and a 30,000 summer steelhead smolt release, both direct plants into the East Fork Lewis River from Skamania Hatchery.

Recommendations

Due to the ecological and genetic risks from the segregated summer steelhead program on the ESA listed steelhead (Kostow, 2003, 2004, 2006), this program should be modified in one of three ways to meet standards of a primary population: (1) reduce the size of the hatchery program (by about 50%); (2) manage to remove additional hatchery adults (harvest or adult trap); or (3) replace with an integrated summer run program of up to 40,000 smolts. In any case, manage acclimation and release to reduce residualism to the extent possible. This integrated solution (40,000 smolts) will require the development of a juvenile acclimation pond and methods to collect natural-origin adults for broodstock (pNOB 100%).

This stream is a good candidate to be a Wild Steelhead Management Zone. This would require eliminating all hatchery releases in the East Fork Lewis.

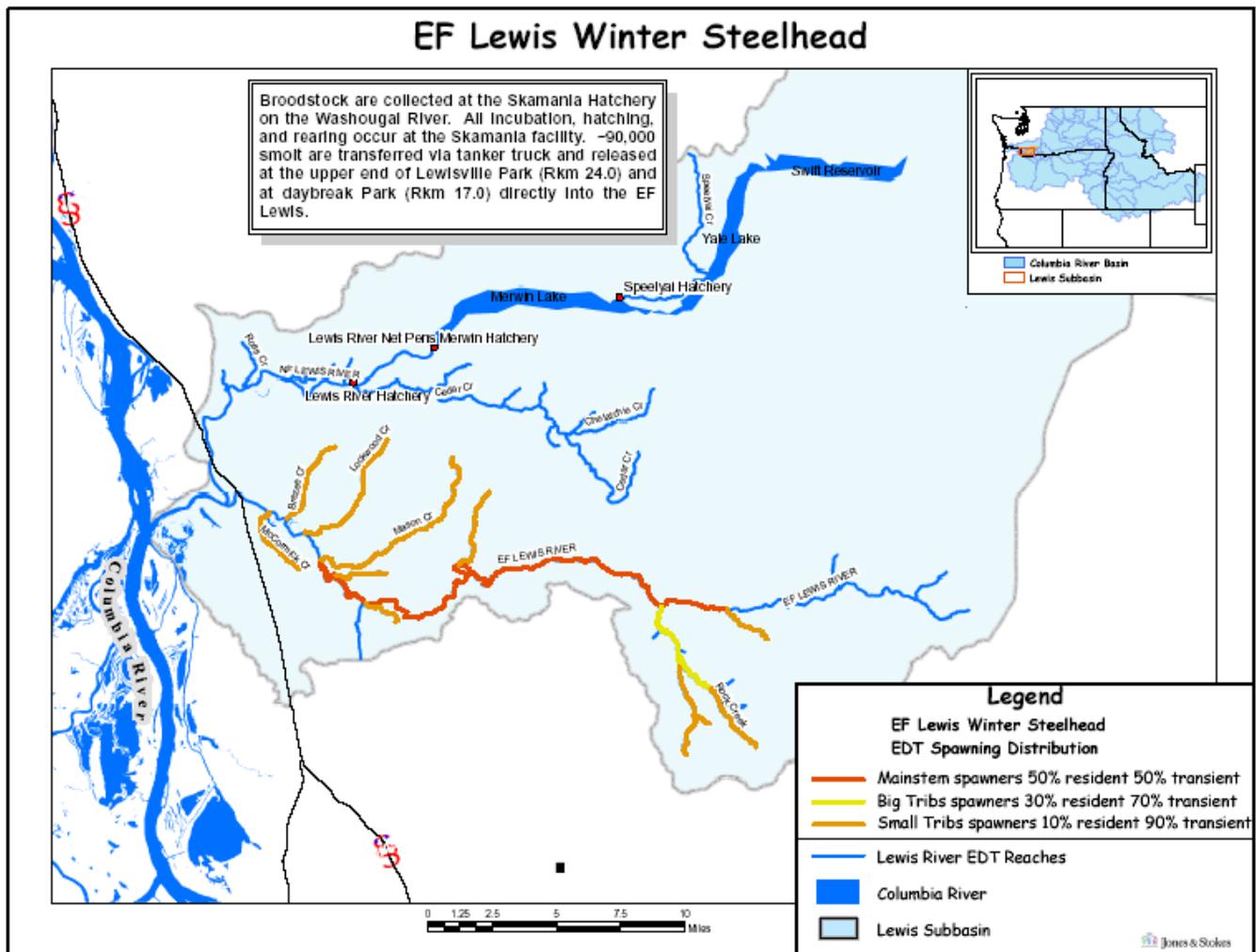
Table 1. Results of HSRG analysis of current condition and HSRG Solution for East Fork Lewis River Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 4% | 0.00 | 392 | 1.9 | 23 | 0 |
| | Seg Harv | 24.7 | 0% | | | | | | 228 | 0 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 599 | 2.8 | 35 | - |
| HSRG Solution | Int Harv | 40.7 | 20% | 0% | 15% | 0.87 | 563 | 2.7 | 409 | 31 |
| | Seg Harv | - | 0% | | | | | | - | - |
| HSRG Solution w/ Improved Habitat | Int Harv | 40.7 | 20% | 0% | 13% | 0.88 | 648 | 3.0 | 414 | 31 |
| | Seg Harv | - | 0% | | | | | | - | - |

Hatchery Scientific Review Group Review and Recommendations

East Fork Lewis River Winter Steelhead Population and Related Hatchery Programs

January 31, 2009



1 East Fork Lewis River Winter Steelhead

East Fork Lewis River winter steelhead were identified as a stock based on their distinct spawning distribution and later run timing. Spawning takes place in the East Fork Lewis River and its tributaries from early March to early June.

Stock status was rated as Depressed in 2002 because of chronically low escapements. A new escapement index was instituted in 1997 and its relationship to the previous escapement index is currently unknown. The escapement index that was used through 1995 showed a trend of chronically low escapements in the East Fork Lewis, and there are no indications that the status of the stock has improved in recent years.

Genetic sampling was conducted in 1996; however, comparisons of allele frequencies between this stock and other lower Columbia steelhead stocks for determining stock distinctiveness are not very informative (Myers et al. 2002).

2 Current Conditions

2.1 Current Population Status and Goals

- **ESA Status:** This population is listed as threatened and is part of the Lower Columbia River ESU.
- **Population Description:** The population has been designated as Primary in the Lower Columbia River Recovery Plan.
- **Current Viability Rating:** Medium
- **Recovery Goal for Abundance:** 500 fish
- **Productivity Improvement Expectation:** 25%
- **Habitat Productivity and Capacity (from EDT):** Productivity: 4.37; Capacity: 6.5 (<http://www.nwcouncil.org/fw/subbasinplanning/lowerColumbia/plan/>)

2.2 Current Hatchery Programs Affecting this Population

Fish planted in the East Fork Lewis River are progeny from the Skamania (Washougal subbasin) Hatchery that were originally an early returning winter run of Chambers Creek origin. This is a direct plant of 90,000 smolts. For summer populations, the progeny of 20 broodstock are transferred to the East Fork (again from Skamania hatchery), resulting in approximately 24,000 smolts. The current hatchery program is described as a segregated harvest program. There are no hatchery facilities located on the East Fork Lewis River. The estimated number of hatchery strays affecting this program is:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 475 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning

population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.1 to 4.1. Average abundance of natural-origin spawners (NOS) would increase from 270 to 587. Harvest contribution of the natural and hatchery populations would go from 817 to 34.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The East Fork Lewis winter steelhead population is listed as a Primary population for recovery. Two segregated hatchery steelhead programs affect this population: a 90,000 early winter smolt release and a 30,000 summer steelhead smolt release, both direct plants into the East Fork Lewis River from Skamania Hatchery.

There are no hatchery facilities on the East Fork Lewis or adult collection facilities to manage the number of hatchery-origin adults spawning naturally. There is no capability to capture unharvested winter steelhead in the East Fork Lewis. This causes a genetic impact and the ecological effects may be significant. The proportion of hatchery fish on the spawning ground exceeds 60%, resulting in an effective pHOS greater than 10%.

Recommendations

Due to the ecological and genetic risks from the segregated winter steelhead program on the ESA listed winter steelhead, this program should be modified in one of three ways to meet standards of a primary population: (1) reduce the size of the current segregated winter steelhead hatchery program to approximately 20,000 smolts; (2) reduce the size of the current segregated winter steelhead hatchery program to approximately 45,000 smolts and manage to remove 50% of the unharvested hatchery adults; or (3) replace with an integrated winter run program of approximately 40,000 smolts (with pNOB of 100%) and manage to remove 50% of the unharvested hatchery adults. All of these options represent a reduced genetic and ecological risk compared to current conditions. In any case, manage acclimation and release to reduce residualism, and recapture unharvested adults to the extent possible.

This stream is a good candidate to be a Wild Steelhead Management Zone. This would require eliminating all hatchery releases in the East Fork Lewis.

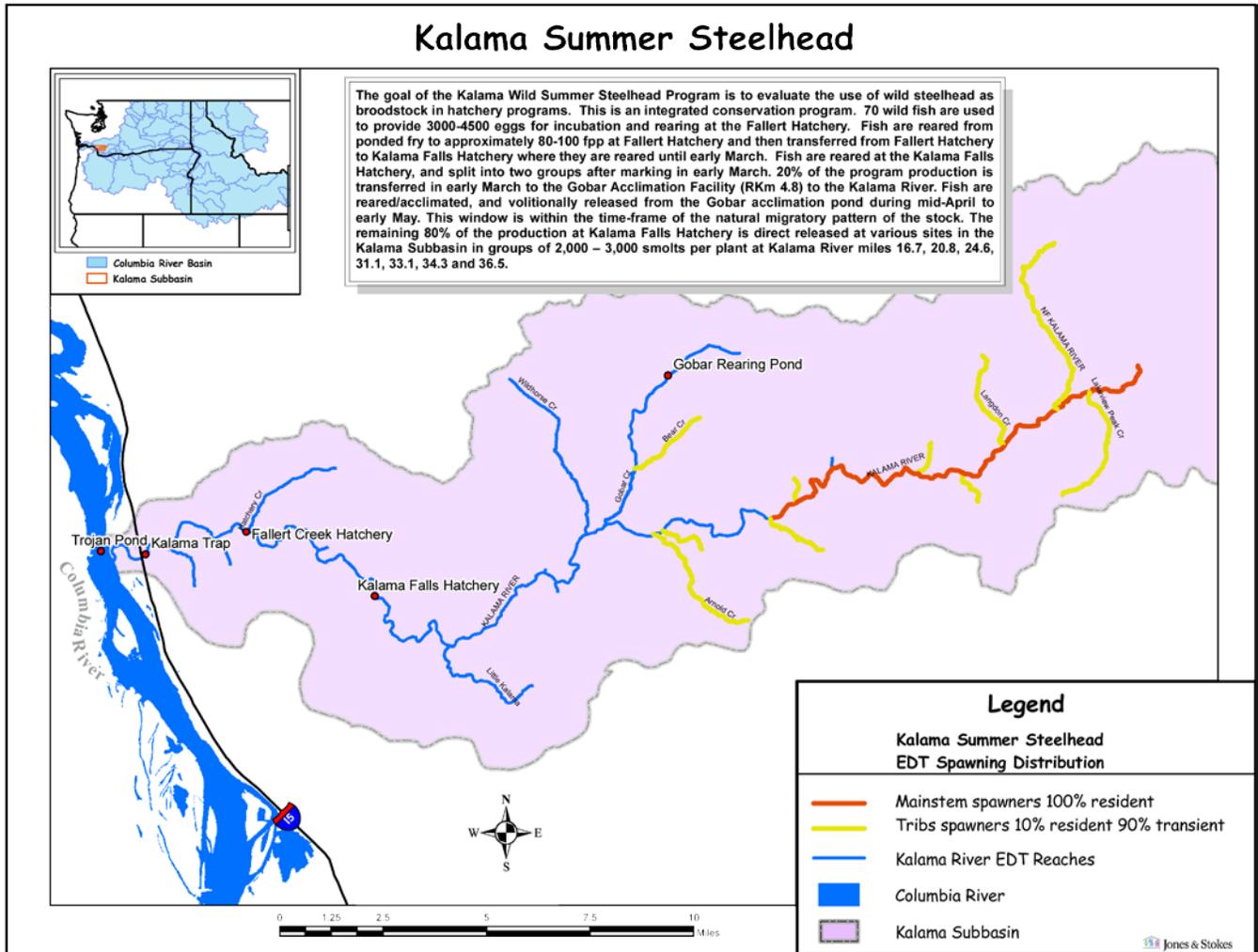
Table 1. Results of HSRG analysis of current condition and HSRG Solution for East Fork Lewis River Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 23% | 0.00 | 270 | 2.1 | 16 | 0 |
| | Seg Harv | 90.7 | 0% | | | | | | 801 | 1 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 587 | 4.1 | 34 | - |
| HSRG Solution | Int Both | 40.3 | 50% | 0% | 4% | 0.96 | 485 | 4.0 | 387 | 111 |
| | Seg Harv | - | 0% | | | | | | - | - |
| HSRG Solution w/ Improved Habitat | Int Both | 40.3 | 50% | 0% | 4% | 0.96 | 563 | 4.4 | 392 | 111 |
| | Seg Harv | - | 0% | | | | | | - | - |

Hatchery Scientific Review Group Review and Recommendations

Kalama River Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Kalama Summer Steelhead

Kalama summer steelhead were identified as a stock based on their distinct spawning distribution and early run timing. Most spawning takes place in the mainstem Kalama above lower Kalama Falls and in Gobar, Elk, and Fossil creeks, which are also located above the falls. Spawning generally occurs from mid-January through April.

Kalama summer steelhead were rated Depressed in 2002 based on a short-term severe decline in escapement from 1998 through 2001. Escapements in 1998 through 2001 were only 14% to 33% of the goal (SaSSI 2002) which is 1,000 adult spawners.

Genetic sampling was conducted in 1994; however, the collected juveniles may have contained both summer and winter steelhead, so comparisons of this collection with others are not very informative (Myers et al. 2002).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Summer steelhead, native to this system, are listed as threatened, and are part of the Lower Columbia River Steelhead DPS.
- Population Description: Primary
- Recovery Goal for Abundance: 500
- Productivity Improvement Expectation: 0%
- Habitat Productivity and Capacity (e.g., from EDT): Productivity: 3.23; Capacity: 857

2.2 Current Hatchery Programs Affecting this Population

There is a 30,000 smolt segregated summer steelhead program (Skamania origin) and a 30,000 smolt integrated summer steelhead program (100% pNOB). In addition, there is a 45,000 smolt segregated winter steelhead program (early winter Chambers-origin) and a 45,000 smolt integrated winter steelhead program (100% pNOB) in this basin. All hatchery-origin adults (ad clipped) are captured at Kalama Falls and recycled through the lower river for additional harvest opportunity. The estimated number of hatchery strays affecting this program are as follows:

- Hatchery strays from in-basin integrated hatchery program – from AHA summary: 27
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs – from AHA summary: 32

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For

integrated populations the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.9 to 2.9. Average abundance of natural-origin spawners (NOS) would decrease from 484 to 706. Harvest contribution of the natural and hatchery populations would go from 1,405 to 75.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated a Primary population. Only natural-origin adults are passed upstream. There is a 30,000 smolt segregated summer steelhead program and a 60,000 smolt integrated summer steelhead program. In addition there is a 45,000 smolt segregated winter steelhead program and a 45,000 smolts integrated winter steelhead program in this basin. All hatchery-origin adults are captured and recycled through the lower river for additional harvest opportunity. We also note the reproductive success research on-going in the upper basin using summer steelhead.

Recommendations

Based on the information provided, the HSRG recommends eliminating the segregated program and increasing the integrated program to an approximate 90,000 smolt release. This will reduce the number of populations to manage in the watershed and reduce the risk to this Primary summer steelhead population while still providing harvest.

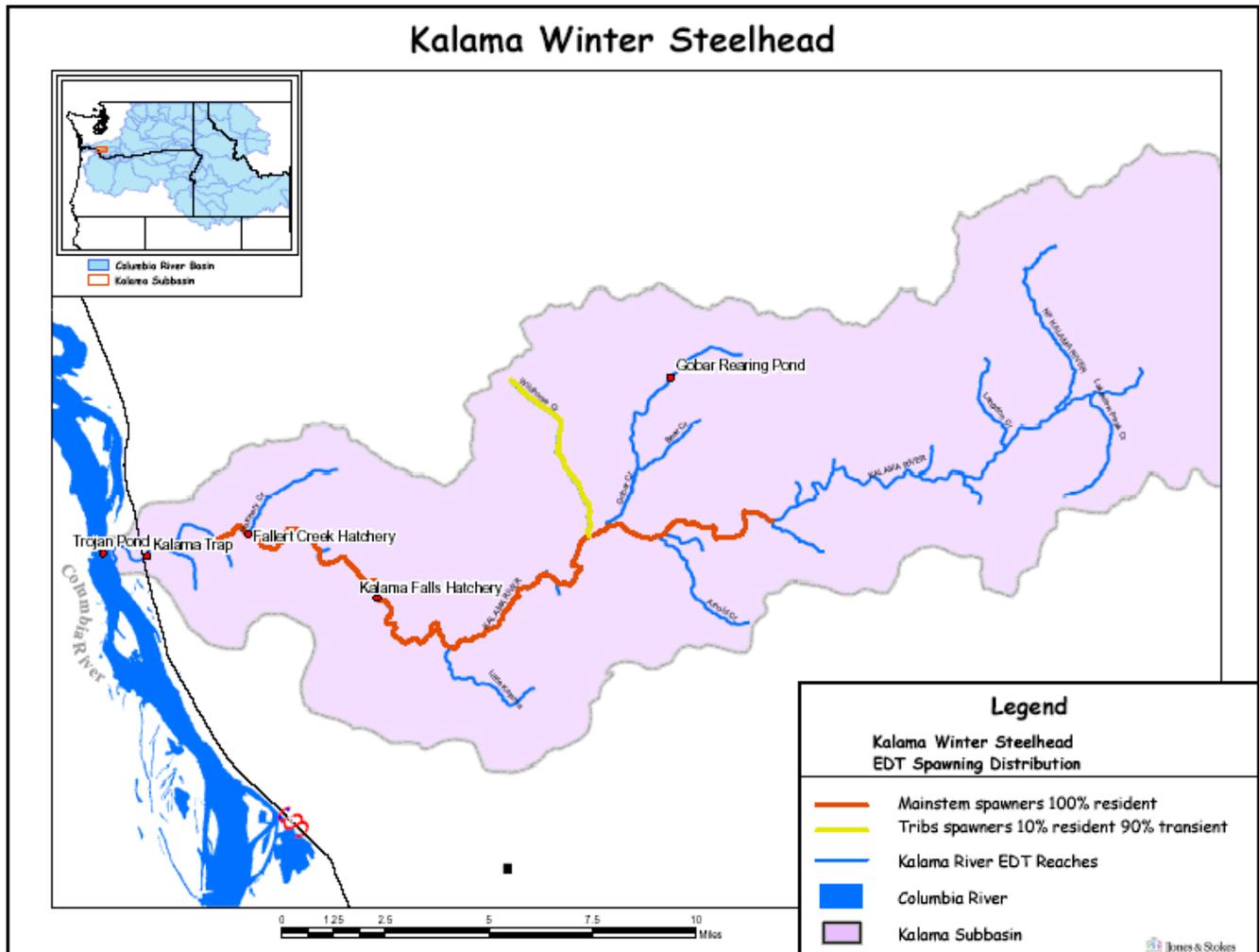
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Kalama Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 30.7 | 90% | 0% | 5% | 0.00 | 484 | 1.9 | 746 | 251 |
| | Seg Harv | 30.7 | 90% | | | | | | 694 | 251 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 706 | 2.9 | 75 | - |
| HSRG Solution | Int Cons | 86.7 | 90% | 0% | 9% | 0.68 | 621 | 2.5 | 2,029 | 657 |
| | Seg Harv | - | 90% | | | | | | - | - |
| HSRG Solution w/ Improved Habitat | Int Cons | 86.7 | 90% | 0% | 8% | 0.71 | 728 | 2.8 | 2,041 | 657 |
| | Seg Harv | - | 90% | | | | | | - | - |

Hatchery Scientific Review Group Review and Recommendations

Kalama River Winter Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Kalama River Winter Steelhead

Kalama winter steelhead were identified as a stock based on their distinct spawning distribution and later run timing. Stock status was rated Healthy in 2002 because this stock has maintained relatively stable escapement estimates within the normal range of variation. A stock escapement goal of 1,000 fish has been established.

Most spawning takes place in the mainstem Kalama River and in tributaries such as Gobar, Elk, and Fossil creeks. Spawning generally occurs from early January through early June.

Genetic sampling was conducted in 1994, however, the collection (juveniles) may have contained both summer and winter steelhead, so comparisons of this collection with others are not very informative (Myers et al. 2002).

2 Current Conditions

2.1 Current Population Status and Goals

The Kalama River supports native winter-run and summer-run steelhead populations. Both the naturally-spawning winter-run and summer-run steelhead population are considered Primary populations for ESA Recovery of the Lower Columbia Steelhead DPS.

- **ESA Status:** This population is listed as threatened under the ESA and is part of the Lower Columbia River Steelhead DPS. This ESU includes all natural-origin steelhead between the Cowlitz and Wind rivers, inclusively, on the Washington side of the Columbia, as well as natural-origin steelhead in the Clackamas, Sandy, and Hood rivers, inclusively, on the Oregon side.
- **Population Description:** This is a Primary population.
- **Current Viability Rating:** Medium +
- **Recovery Goal for Abundance:** High +, with a goal of 650 natural origin recruits (a 46% improvement)
- **Productivity Improvement Expectation:** 5.8 maximum recruits/spawner (45% improvement)
- **Habitat Productivity and Capacity (from EDT):** Productivity 4.0; Capacity 445
Note that in the Lower Columbia River Recovery Plan, the capacity was defined as 541 adults.

2.2 Current Hatchery Programs Affecting this Population

WDFW currently conducts two hatchery programs for winter-run steelhead on the Kalama River: (1) an “early-run” segregated-harvest program using a stock of Chambers Creek origin and (2) an integrated late-run research program that is evaluating the feasibility of an endemic broodstock program derived from natural-origin adults trapped in the Kalama River. Each program releases approximately 45,000 yearling smolts (90,000 yearling smolts total). In addition, there are two hatchery summer steelhead programs, one integrated and one segregated (30,000 smolts each).

Adults for both programs are trapped at the Kalama Falls Hatchery. Approximately 40 early-run hatchery-origin adults are required each year to produce 45,000 smolts for the segregated early-run broodstock program. Approximately 48 late-run natural-origin adults are required each year to produce 45,000 smolts for the endemic integrated program. Fertilized eggs for both programs are incubated, hatched, and reared at the Fallert Creek Hatchery on the lower Kalama River. Pre-

smolts for both programs are transferred to Gobar Pond (upstream of Kalama Falls Hatchery) for acclimation and release.

The estimated mean terminal harvest for *early* winter-run hatchery steelhead in the Kalama River is approximately 350 adults per year. The estimated mean terminal harvest for *late endemic* winter-run hatchery steelhead in the Kalama River is approximately 480 adults per year.

Estimated mean R/S for *early* winter-run hatchery produced fish \approx 13.5 recruits/spawner.

Estimated R/S for *late endemic* winter-run hatchery produced fish \approx 15.3 recruits/spawner.

- PNI: 0.94
- pHOS: 7%
- Estimated Productivity with harvest and fitness factors adjusted from AHA: 2.71
- Projected Average Natural-origin Recruit Escapement: 382 adults
- Hatchery strays from in-basin integrated hatchery program: 30 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 30 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain at 2.7. Average abundance of natural-origin spawners (NOS) would increase from 382 to 458. Harvest contribution of the natural and hatchery populations would go from 920 to 44.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager’s goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population is designated a Primary population. Only natural-origin adults are passed upstream. There is a 45,000 smolt segregated winter steelhead program and a 45,000 smolt integrated winter steelhead program. In addition there is a segregated summer steelhead program of 30,000 smolts and an integrated summer steelhead program of 30,000 smolts. All hatchery-origin adults are captured and recycled through the lower river for additional harvest opportunity.

Recommendations

It might be preferable to manage this population as an integrated population. Managers should consider this population in context of all Primary winter steelhead populations in the ESU. Based on the information provided, the HSRG recommends eliminating the segregated program and increasing the integrated program to approximately a 100,000 smolt release. This will reduce the number of populations to manage in the watershed and reduce the risk to this Primary steelhead population while still providing harvest.

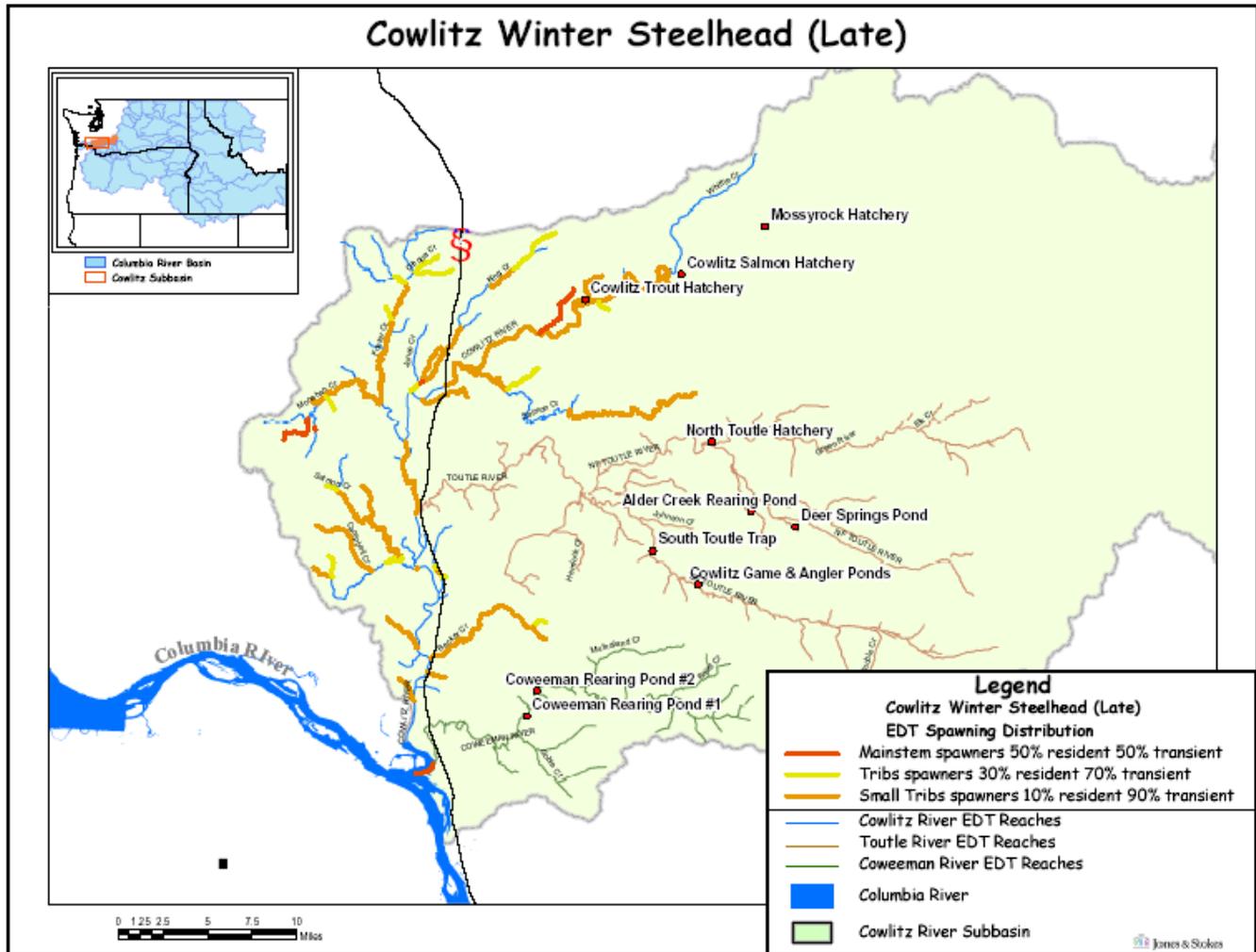
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Kalama River Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Harv | 45.2 | 90% | 0% | 7% | 0.94 | 382 | 2.7 | 548 | 282 |
| | Seg Harv | 45.8 | 90% | | | | | | 372 | 168 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 458 | 2.7 | 44 | - |
| HSRG Solution | Int Harv | 99.7 | 90% | 0% | 13% | 0.71 | 362 | 2.4 | 1,155 | 551 |
| | Seg Harv | - | 90% | | | | | | - | - |
| HSRG Solution w/ Improved Habitat | Int Harv | 99.7 | 90% | 0% | 11% | 0.74 | 435 | 2.7 | 1,162 | 551 |
| | Seg Harv | - | 90% | | | | | | - | - |

Hatchery Scientific Review Group Review and Recommendations

Lower Cowlitz River Winter Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Lower Cowlitz Winter Steelhead

There are no adequate abundance trend data available for Cowlitz winter steelhead, so their status was identified as Unknown in 2002. The status may be considered Depressed because access to 80 percent of their historic habitat has been lost due to dam construction. Cowlitz winter steelhead were identified as a stock based on their distinct spawning distribution (SaSSI 2002).

Most spawning downstream of Mayfield Dam takes place in the lower mainstem Cowlitz River and in Ostrander and Salmon creeks. Spawning also takes place in Olequa, Stillwater, Whittle, Arkansas, and Delameter creeks. Cowlitz winter steelhead are trucked above the three dams on the Cowlitz River and released into the Tilton River and Lake Scanewa, the uppermost reservoir. Spawning occurs in the Tilton River, the Cispus River and its tributaries, and the upper Cowlitz and its tributaries. Spawning generally occurs from March to early June (SaSSI 2002).

No genetic analysis has been done on naturally spawning Cowlitz winter steelhead. Cowlitz Hatchery late winter steelhead, derived from native broodstock, were sampled in 1996; however, comparisons of allele frequencies between this stock and other lower Columbia steelhead stocks for determining stock distinctiveness are not very informative (Myers et al. 2002).

2 Current Conditions

2.1 Current Population Status and Goals

The Cowlitz River is habitat for native late stock winter steelhead that are ESA-listed as threatened. The lower Cowlitz supports substantial summer and winter steelhead fisheries based on the hatchery programs. Significant winter steelhead habitat exists in the upper Cowlitz (above Cowlitz Falls Dam) to which adult fish are transported. This separation and transportation effort allows managers to remove any number of hatchery fish from this upper habitat. The upper basin therefore can be managed for native fish recovery regardless of management policies in the lower basin.

- ESA Status: This population is listed as threatened and is part of the Lower Columbia River Steelhead ESU.
- Population Description: Contributing
- Current Viability Rating: Low
- Recovery Goal for Abundance: 400
- Productivity Improvement Expectation: 5%
- Habitat Productivity and Capacity (from EDT): Productivity: 2.80; Capacity: 866
- Populations Affected by this Hatchery Population Include: Cowlitz winter steelhead
- Current Hatchery Programs Affecting this Population:

2.2 Current Hatchery Programs Affecting this Population

Three hatchery steelhead programs are operated in the basin: (1) a native late winter program of 288,000 smolts in the lower river, 75,000 smolts released above Cowlitz Falls Dam for passage tests, and 200,000 fingerlings planted above Cowlitz Falls Dam as part of the reintroduction plan; (2) a segregated hatchery early winter program of 300,000 smolts; and (3) a segregated hatchery summer component of 450,000 smolts released at the hatchery and 100,000 smolts released in the lower river from a co-op. There are no native summer steelhead in the Cowlitz River.

- PNI and pHOS Estimates (include straying from all hatchery programs): 14%
- Estimated Productivity (with harvest and fitness factors adjusted from AHA): 1.31
- Projected Average Natural Origin Escapement: 468

Average Harvest Contribution: 11,607 steelhead (all programs)

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.3 to 2.6. Average abundance of natural-origin spawners (NOS) would increase from 468 to 714. Harvest contribution of the natural and hatchery populations would go from 11,607 to 41.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager’s goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population has been designated as a Contributing population in the lower Columbia ESU and is affected by three hatchery steelhead programs: (1) a native late winter program of 288,000 smolts in the lower river, 75,000 smolts released above Cowlitz Falls Dam for passage tests, and 200,000 fingerlings planted above Cowlitz Falls Dam as part of the reintroduction plan; (2) , a segregated hatchery early winter program of 300,000 smolts; and (3) a segregated hatchery summer component of 450,000 smolts released at the hatchery and 100,000 smolts released in the lower river from a co-op site. The program is exceeding the guidelines for a Contributing population. The percent of hatchery fish on the spawning grounds is close to 50%, which results in an effective pHOS greater than 10%.

To meet the standards for a Contributing population, the total smolt release from each of the harvest programs would need to be reduced by half.

The management intent is to transition to an integrated program for the late winter steelhead. In addition, a settlement agreement with Tacoma Power is now in place that includes reintroduction of the late winter component into the upper watershed.

Recommendations

If this population were designated as Stabilizing, then current programs could be retained, continuing the transition of the late winter integrated program.

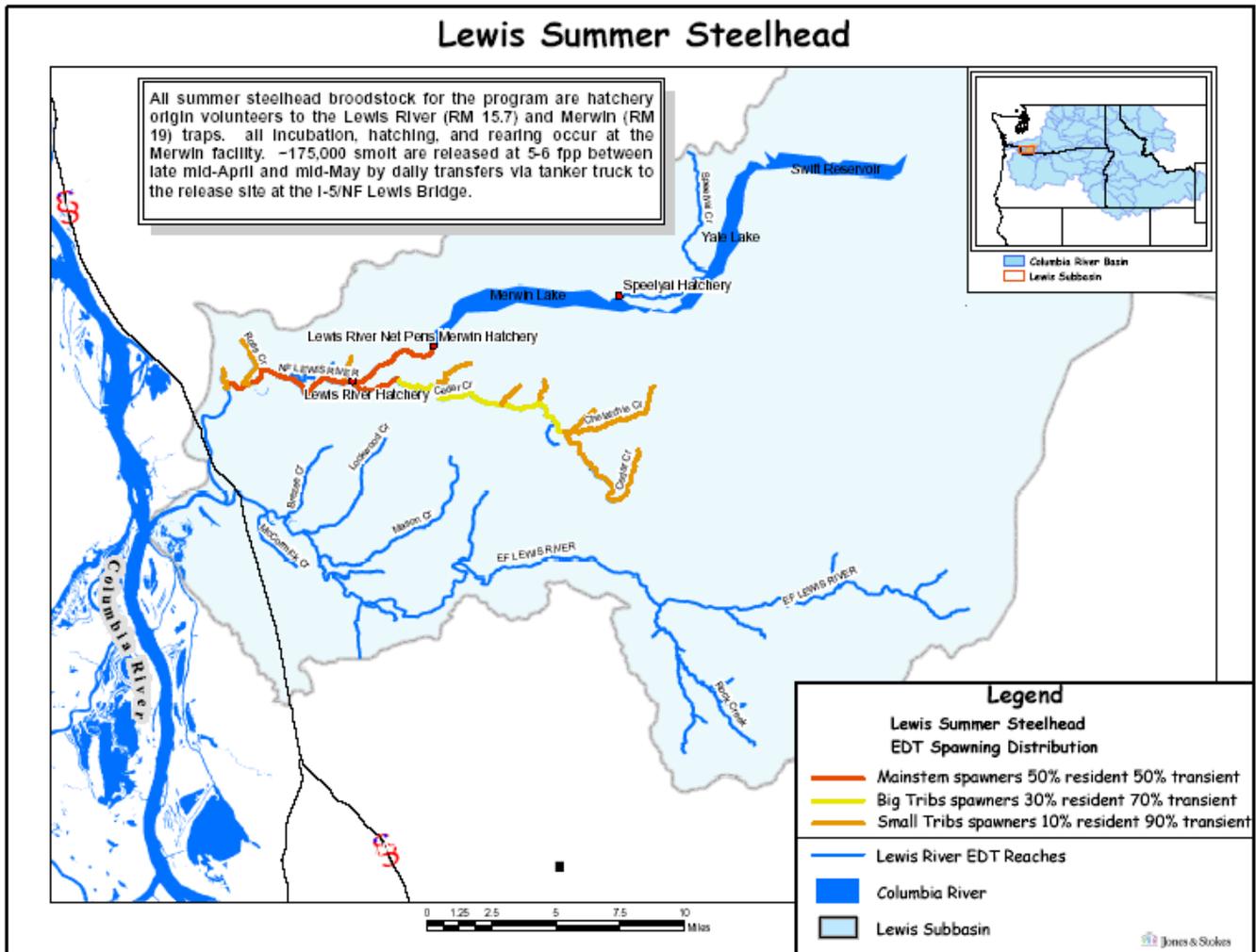
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Lower Cowlitz River Winter Steelhead. The yellow row indicates the natural population and light green indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the addition effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-----------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Harv | 288.7 | 90% | 0% | 14% | 0.00 | 468 | 1.3 | 557 | 75 |
| | Seg Harv | 302.4 | 75% | | | | | | 2,399 | 939 |
| | Summer Stlhd Seg Harv | 549.2 | 95% | | | | | | 8,650 | 2,925 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 714 | 2.6 | 41 | - |
| HSRG Solution | Int Harv | 288.7 | 90% | 0% | 19% | 0.72 | 635 | 2.3 | 2,041 | 1,041 |
| | Seg Harv | 302.4 | 75% | | | | | | 2,399 | 939 |
| | Summer Stlhd Seg Harv | 549.2 | 95% | | | | | | 8,650 | 2,925 |
| HSRG Solution w/ Improved Habitat | Int Harv | 288.7 | 90% | 0% | 17% | 0.75 | 739 | 2.5 | 2,047 | 1,041 |
| | Seg Harv | 302.4 | 75% | | | | | | 2,399 | 939 |
| | Summer Stlhd Seg Harv | 549.2 | 95% | | | | | | 8,650 | 2,925 |

Hatchery Scientific Review Group Review and Recommendations

North Fork Lewis River Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 North Fork Lewis River Summer Steelhead

The North Fork Lewis River native summer steelhead population is documented in the Lower Columbia River Salmon Recovery Plan (LCRSRP). The 2002 WDFW SaSi report also identifies a native population with wild production, although the 2002 report rated this stock status as “unknown” since there are no adequate abundance trends available.

The North Fork Lewis River summer steelhead were identified as a stock based on their distinct spawning distribution and run timing. Most spawning takes place in the North Fork Lewis River, Cedar Creek and their tributaries. Spawning generally occurs from early March through early June (WDFW 2002). The historical North Fork Lewis River summer steelhead population was likely less than average. Current status is very Low, with the majority of production occurring in Cedar Creek (LCRSRP).

2 Current Conditions

2.1 Current Population Status and Goals

- ESA Status: This population is listed as threatened and is part of the Lower Columbia DPS.
- Population Description: Stabilizing
- Current Viability Rating: Very Low
- Recovery Goal for Abundance: A viability goal of 600 adults was identified in the LCRSRP; an interim goal of 150 adults was also identified. The level of current escapement is unknown.
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity (from EDT): Productivity: 5.3; Capacity: 367. While this stock is described in the LCRSRP, no values for productivity or capacity are provided. For this analysis, the values for North Fork Lewis River winter steelhead were used, although applicability is unknown.

2.2 Current Hatchery Programs Affecting this Population

Hatchery summer steelhead in the North Fork Lewis River come from returning adults trapped at the Merwin Hatchery (North Fork Lewis River). Releases occur in two parts: (1) 175,000 smolts released from the Merwin Hatchery; and (2) 60,000 smolts released from a regional cooperative (Fish First) that rears summer steelhead in net pens in Echo Bay and (3) an additional 50,000 Skamania origin summer steelhead smolts released from Speelyai Bay Net pens that come directly from Skamania Hatchery.

These hatchery populations are affecting natural populations of summer steelhead (e.g., via straying) through direct plants. Results of predation studies show that hatchery fish prey on naturally produced salmonids in the lower Lewis River at significant rates. This problem is exacerbated by the large number (385,000) of non-native early winter and summer steelhead released into the lower river each year. Estimated numbers of hatchery strays affecting this program are:

- Hatchery strays from in-basin integrated hatchery program (from the AHA summary): NA

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs (from AHA summary): 180

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.6 to 4.9. Average abundance of natural-origin spawners (NOS) would increase from 195 to 374. Harvest contribution of the natural and hatchery populations would go from 3,524 to 22.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is designated a Stabilizing population.

Recommendations

The HSRG has no specific recommendations for this program.

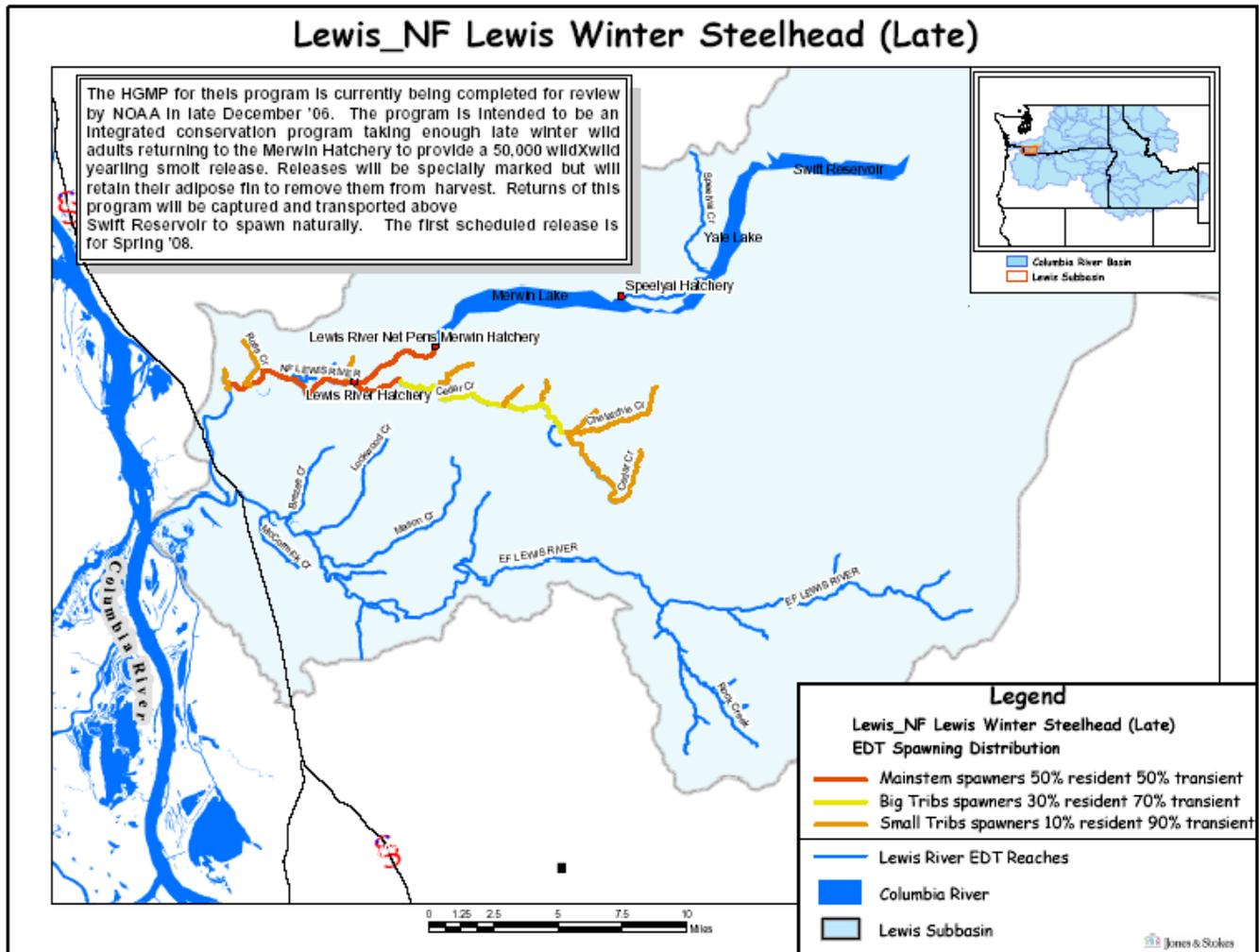
Table 1. Results of HSRG analysis of current condition and HSRG Solution for North Fork Lewis River Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 14% | 0.00 | 195 | 2.6 | 11 | 0 |
| | Seg Harv | 284.8 | 75% | | | | | | 3,513 | 823 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 374 | 4.9 | 22 | - |
| HSRG Solution | None None | - | 0% | 0% | 14% | 0.00 | 196 | 2.6 | 11 | 0 |
| | Seg Harv | 284.8 | 75% | | | | | | 3,513 | 823 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 12% | 0.00 | 228 | 2.8 | 13 | 0 |
| | Seg Harv | 284.8 | 75% | | | | | | 3,513 | 823 |

Hatchery Scientific Review Group Review and Recommendations

North Fork Lewis River Winter Steelhead Population and Related Hatchery Programs

January 31, 2009



1 North Fork Lewis River Winter Steelhead

The North Fork Lewis native winter steelhead population is documented in the Lower Columbia River Salmon Recovery Plan (LCRSRP). The 2002 WDFW SaSi report also identifies a native population with wild production, although the 2002 report rated this stock status as “unknown” since there are no adequate abundance trends available. WDFW has established an escapement goal of 698 fish for this population.

North Fork Lewis River winter steelhead were identified as a stock based on their distinct spawning distribution and run timing. Most spawning takes place in the North Fork Lewis River, Cedar Creek and their tributaries. Spawning generally occurs from early March through early June (WDFW 2002).

2 Current Conditions

2.1 Current Population Status and Goals

- ESA Status: This population is listed as threatened and is part of the Lower Columbia DPS.
- Population Description: Contributing
- Current Viability Rating: Very Low
- Recovery Goal for Abundance: A viability goal of 600 adults was identified in the LCRSRP; an interim goal of 150 adults was also identified.
- Productivity Improvement Expectation: Unknown
Habitat Productivity and Capacity (from EDT): Productivity: 3.49; Capacity: 405

2.2 Current Hatchery Programs Affecting this Population

The Merwin Hatchery releases 100,000 smolts from locally-returning broodstock originating from early-returning Chambers Creek steelhead (in Puget Sound) via the Elochoman Hatchery. In addition, 285,000 summer steelhead are released into the lower river each year. Estimated numbers of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program (from AHA summary): N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs (from AHA summary): 372

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influences, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008). Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.6 to 3.2. Average abundance of natural-origin spawners (NOS) would increase from 158 to 365. Harvest contribution of the natural and hatchery populations would go from 1,131 to 21.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is a Contributing population that does not achieve standards for this designation. Winter steelhead are planned to be reintroduced into the upper Lewis River subbasin. There are two segregated hatchery programs that affect the lower river population, a segregated summer steelhead program releasing 285,000 smolts and a segregated winter steelhead program releasing 100,000 smolts. Hatchery fish make up more than 50% of the spawning escapement, resulting in an effective pHOS greater than 10%. In order to meet the guidelines for a winter steelhead Contributing population, both hatchery programs would need to be reduced to approximately 50,000 smolts each. Managers might consider designating this as a Stabilizing population given the small population capacity of the system and current harvest benefits of the existing programs.

Once passage has been provided above the hydroelectric projects on the North Fork, more management options will be available. If reintroduction is successful, then this population should be re-evaluated for Primary population status and the program type changed to integrated with a corresponding change (increase) in program size.

Recommendations

If designated as a Stabilizing population, the existing programs are consistent with the guidelines for this categorization.

If the program continues to be designated as a Contributing population, the program would have to be reduced as described in Observations above.

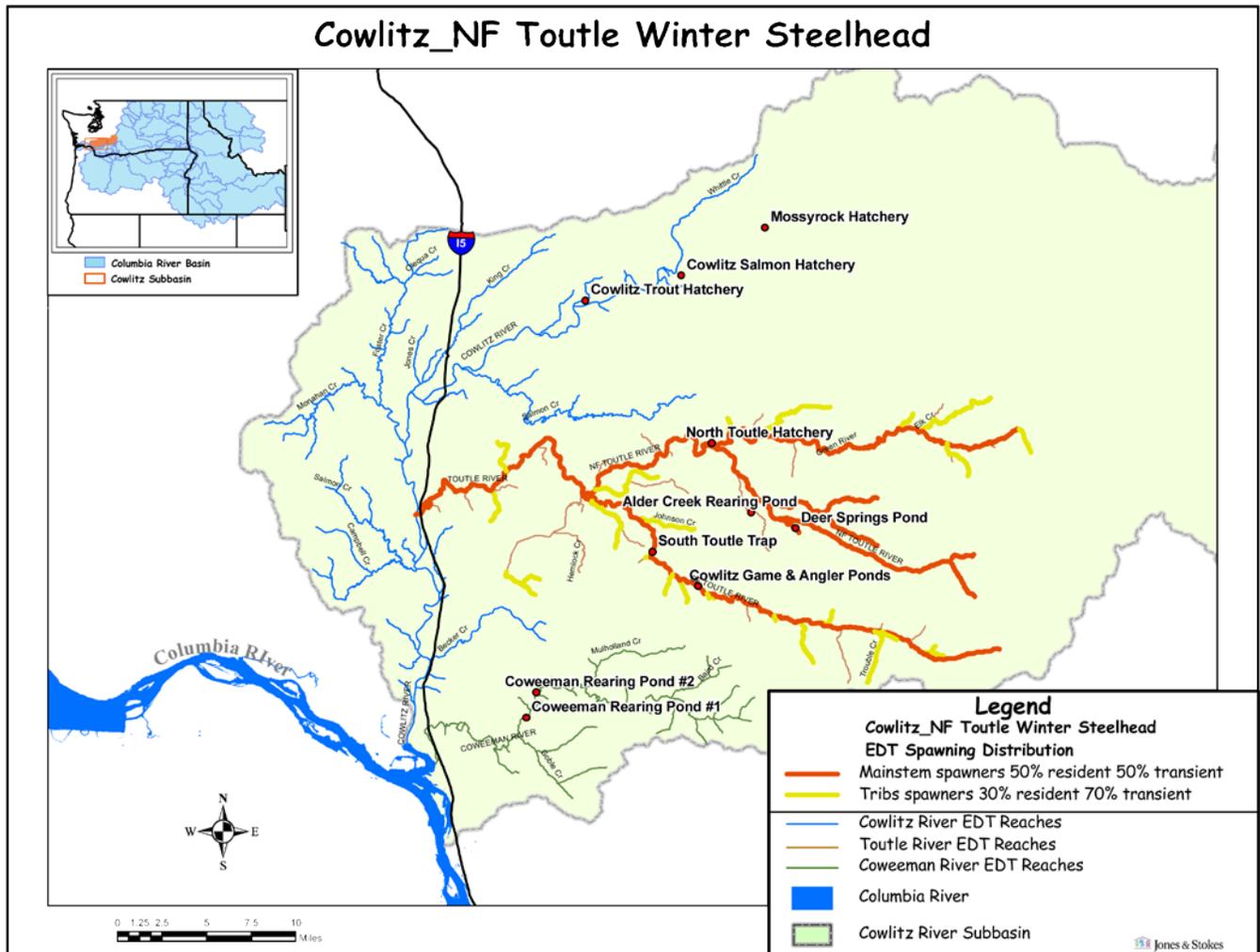
Table 1. Results of HSRG analysis of current condition and HSRG Solution for North Fork Lewis River Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 75% | 0% | 27% | 0.00 | 158 | 1.6 | 9 | 0 |
| | Seg Harv | 100.2 | 75% | | | | | | 1,122 | 416 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 365 | 3.2 | 21 | - |
| HSRG Solution | None None | - | 75% | 0% | 27% | 0.00 | 158 | 1.6 | 9 | 0 |
| | Seg Harv | 100.2 | 75% | | | | | | 1,122 | 416 |
| HSRG Solution w/ Improved Habitat | None None | - | 75% | 0% | 24% | 0.00 | 186 | 1.8 | 11 | 0 |
| | Seg Harv | 100.2 | 75% | | | | | | 1,122 | 416 |

Hatchery Scientific Review Group Review and Recommendations

North Fork Toutle Winter Steelhead Population and Related Hatchery Programs

January 31, 2009



1 North Fork Toutle Winter Steelhead

Mainstem and North Fork Toutle winter steelhead were identified as a stock based on their distinct spawning distribution. Stock status was rated Depressed in 2002 because of chronically low escapements. Escapements have been consistently low as a result of habitat degradation caused by the Mt. St. Helens eruption in 1980. No escapement goal has been established for this stock.

Most spawning takes place in the mainstem and North Fork Toutle rivers generally from March through early June (SaSSI 2002). Spawning also occurs in tributaries such as Alder and Deer creeks.

Genetic sampling was conducted in 1995; however, comparisons of allele frequencies between this stock and other lower Columbia steelhead stocks for determining stock distinctiveness are not very informative (Myers et al. 2002).

Green (Toutle) winter steelhead were identified as a stock based on their distinct spawning distribution. This is a native stock with wild production (SaSSI 2002). An escapement goal of 1,100 fish has been established. Stock status was rated Depressed in 2002 because of chronically low escapements. Most spawning takes place in the Green River and in tributaries such as Devil, Elk, and Shultz creeks. Spawning generally occurs from March through early June.

These populations were combined in this analysis as they are not separated in the Lower Columbia River Recovery Plan.

2 Current Conditions

2.1 Current Population Status and Goals

This is a segregated hatchery program releasing Skamania summer steelhead. The current program is 25,000 yearling smolts.

- ESA Status: Late winter steelhead, native to this system, are listed as threatened, and are part of the Lower Columbia River Steelhead DPS.
- Population Description: Primary
- Current Viability Rating: Very Low
- Recovery Goal for Abundance: 600
- Productivity Improvement Expectation: 125%

Habitat Productivity and Capacity (from EDT): Productivity: 2.79; Capacity: 963

2.2 Current Hatchery Programs Affecting this Population

The current program is a segregated harvest program of Skamania stock summer steelhead that releases 25,000 smolts into the North Fork Toutle River.

- pHOS Estimates (include straying from all hatchery programs): 6%
- Estimated Productivity (with harvest and fitness factors adjusted from AHA): 1.6 productivity of the native winter steelhead
- Projected Average Natural Origin Escapement: 424 winter steelhead

- Average Harvest Contribution: 436 summer steelhead and 25 natural winter steelhead
- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 150 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.6 to 2.6. Average abundance of natural origin spawners (NOS) would increase from 424 to 795. Harvest contribution of the natural and hatchery populations would go from 461 to 46.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager’s goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The North Fork Toutle winter steelhead population is listed as a Primary population for recovery. There is no hatchery program for late winter steelhead, but there is a straying issue due to segregated summer run steelhead plants in the Toutle (in both North Fork [25,000] and South Fork [25,000] which originate from Skamania Hatchery). This causes a small genetic impact, but the ecological effect may be significant. The effective pHOS currently is 6%.

Recommendations

Due to the ecological and genetic risks from the segregated summer steelhead program on the ESA listed winter steelhead, this program should be modified in one of three ways to meet standards of a primary population: (1) reduce the size of the hatchery program; (2) manage to remove hatchery adults; or (3) replace with an integrated winter run program. In any case, manage acclimation and release to reduce residualism to the extent possible. If the program is converted to an integrated program, it should have a PNI greater than 0.67 and a pHOS less than 30% (for example, 142,000 release and pNOB of 30%). Means will be needed to collect natural-origin adults and to remove at least 90% of the unharvested returning hatchery-origin adults.

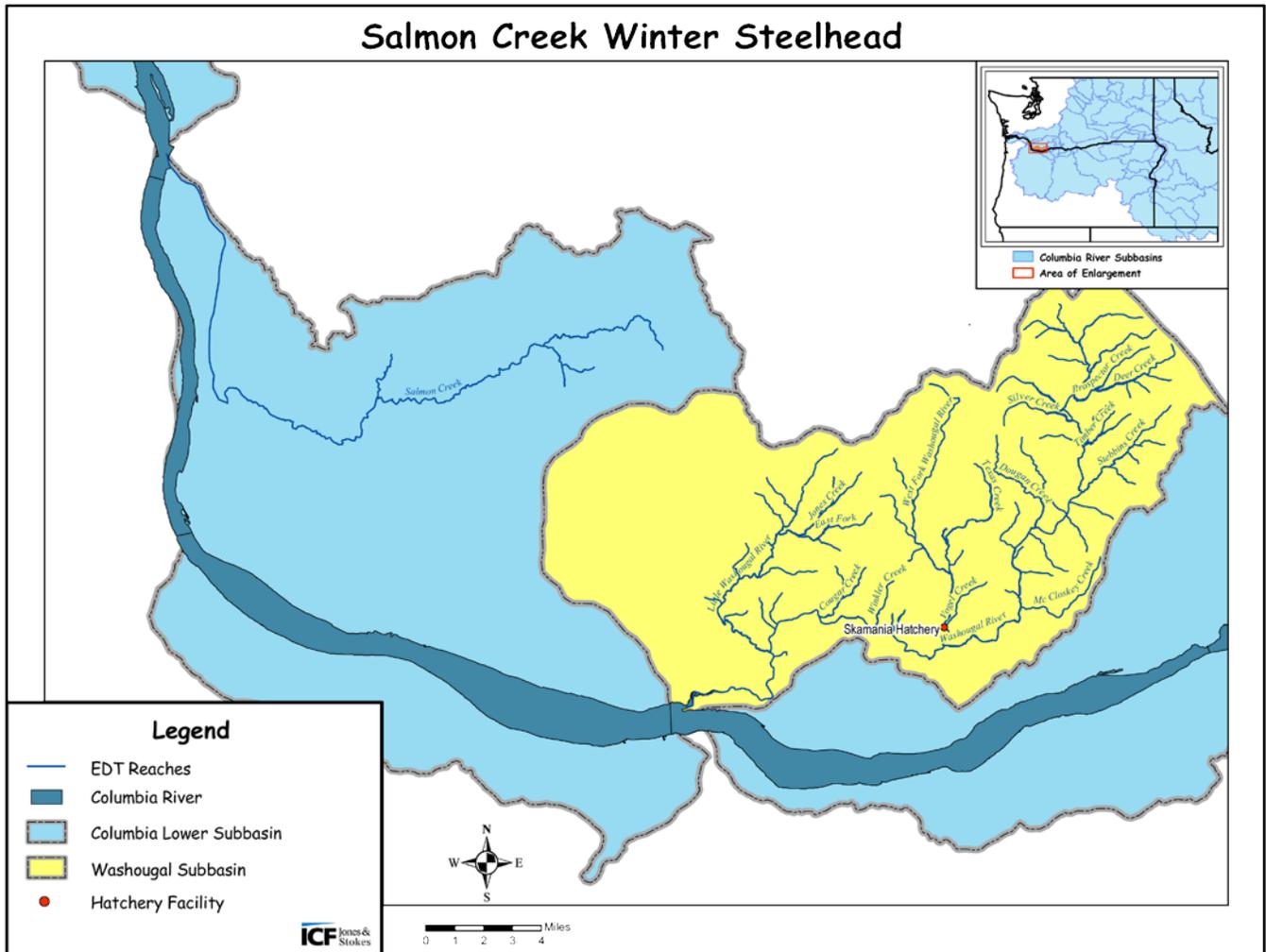
Table 1. Results of HSRG analysis of current condition and HSRG Solution for North Fork Toutle Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 6% | 0.00 | 424 | 1.6 | 25 | 0 |
| | Seg Harv | 24.7 | 0% | | | | | | 436 | 0 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 795 | 2.6 | 46 | - |
| HSRG Solution | Int Harv | 142.2 | 90% | 0% | 4% | 0.87 | 666 | 2.5 | 1,936 | 605 |
| | Seg Harv | - | 0% | | | | | | - | - |
| HSRG Solution w/ Improved Habitat | Int Harv | 142.2 | 90% | 0% | 3% | 0.91 | 802 | 2.8 | 1,944 | 605 |
| | Seg Harv | - | 0% | | | | | | - | - |

Hatchery Scientific Review Group Review and Recommendations

Salmon Creek Winter Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Salmon Creek Winter Steelhead

Salmon Creek winter steelhead were identified as a stock based on their distinct spawning distribution. Spawning takes place in Salmon Creek (Clark County) and tributaries from early March through early June. There are no adequate abundance trend data available for Salmon Creek winter steelhead, so their status is Unknown. An escapement goal of 400 fish has been established for this stock (SaSSI 2002).

No genetic analysis has been done on Salmon Creek winter steelhead.

2 Current Conditions

2.1 Current Population Status and Goals

- ESA Status: This population is listed as threatened and is part of the Lower Columbia DPS.
- Population Description: Stabilizing
- Current Viability Rating: Very Low
- Recovery Goal for Abundance: Unknown
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity (from EDT): Productivity: 2.40; Capacity: 64

2.2 Current Hatchery Programs Affecting this Population

The broodstock for this program is obtained from the Skamania Hatchery on the Washougal River. Adults are captured at Skamania Hatchery, where incubation and rearing occur. Currently, Skamania Hatchery provides 20,000 adipose-clipped pre-smolts for the Salmon Creek net pen program. The program is operated as a segregated-harvest program, but no collection of surplus returned adults at the net pen release site is possible.

- Projected pHOS Estimates (includes strays from all hatchery programs): 30%
- Estimated Adjusted Productivity (with harvest and with fitness factor effects from AHA): 1.12
- Projected Average Natural Origin Escapement: 19
- Hatchery strays from in-basin integrated hatchery program (from AHA summary): N/A
Hatchery strays from in-basin segregated and out-of-basin hatchery programs (from AHA summary): 43

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less

than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.1 to 2.2. Average abundance of natural-origin spawners (NOS) would increase from 19 to 48. Harvest contribution of the natural and hatchery populations would go from 256 to 3.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population has been designated as a Stabilizing population. The currently operated hatchery program is consistent with that designation. One segregated hatchery program affects this population. A plant of 20,000 early winter steelhead from Skamania Hatchery is transferred to Kline Pond for acclimation and release into Salmon Creek. Salmon Creek has no adult collection facilities.

Recommendations

The HSRG has no specific recommendations for this program.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Salmon Creek Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 75% | 0% | 30% | 0.00 | 19 | 1.1 | 1 | 0 |
| | Seg Harv | 24.7 | 75% | | | | | | 255 | 119 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 48 | 2.2 | 3 | - |
| HSRG Solution | None None | - | 75% | 0% | 16% | 0.00 | 20 | 1.1 | 1 | 0 |
| | Seg Harv | 24.7 | 75% | | | | | | 255 | 119 |
| HSRG Solution w/ Improved Habitat | None None | - | 75% | 0% | 14% | 0.00 | 24 | 1.3 | 1 | 0 |
| | Seg Harv | 24.7 | 75% | | | | | | 255 | 119 |

1 Sandy River Winter Steelhead

Winter steelhead in the Sandy River return from December to May and spawn from February to June. Spawning occurs mainly in the Sandy River and all major tributaries. Annual abundance data are available from Marmot Dam counts. The population long-term geometric mean is about 850 natural-origin spawners, which is in the viable minimum abundance threshold category. However, productivity appears to be very low and appears to be associated with a high proportion of hatchery-origin spawners. Hatchery fish are no longer released in or passed into natural production areas upstream from Marmot Dam. It is too soon to determine whether these changes will improve the status of Sandy steelhead, but that is the intent. Significant portions of the historical winter steelhead habitat in the Sandy have been blocked by dams in the Bull Run and Little Sandy watersheds. Large areas of productive high quality habitat remain accessible to steelhead in the remainder of the basin, particularly in the forested upper basin. The long-term effects of the steelhead hatchery program, along with habitat degradation and harvest, have likely reduced diversity of the population.

2 Current Conditions

2.1 Current Population Status and Goals

The Sandy River Winter Steelhead population is a viable indigenous population that is listed as a component of the threatened Lower Columbia River Steelhead DPS. The hatchery program is an integrated harvest augmentation and mitigation program to provide benefits in selective fisheries in the Lower Columbia and Sandy River.

- **ESA Status:** This population is listed as threatened and is part of the Lower Columbia Steelhead DPS.
- **Population Description:** Information is not available, but the population is likely a primary and genetic legacy.
- **Current Viability Rating:** There was no specific viability goal for this population; however, with an abundance of ~1500 fish, this population meets the minimum abundance threshold for a population with a High viability goal.
- **Recovery Goal for Abundance:** None identified
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (modified from EDT):** Productivity: 3.0; Capacity: 2,500

2.2 Current Hatchery Programs Affecting this Population

There are currently two steelhead programs in the Sandy River, an integrated winter harvest program of 160,000 smolts and a segregated summer program of 75,000 smolts.

The winter steelhead hatchery program began in 1955, and a mix of out-of-basin hatchery fish was used as broodstock. Most recently, Big Creek adults were used for broodstock. Brood year 2000 was the first year that all broodstock were from the Sandy River naturally produced population. Broodstock are collected at Marmot Dam (primary site) and at the Sandy Hatchery (secondary site) as unmarked wild Sandy River Winter Steelhead. The broodstock goal is 114

wild adults. There is a long-term goal of reducing the wild portion of the broodstock to 30%. Spawning occurs at the Sandy Hatchery with a goal of producing 160,000 smolts. Eggs are incubated at Sandy, Oxbow, and Irrigon hatcheries. Fry are reared at Oxbow, Irrigon and Bonneville hatcheries. Smolts are acclimated for 2-3 weeks at Sandy Hatchery and volitionally released at 6 fpp in April/ May.

The Sandy River Summer Steelhead Program uses South Santiam stock (stock 024) summer steelhead (*Oncorhynchus mykiss*). The South Santiam stock summer steelhead originated from Skamania stock summer steelhead. The wild population of steelhead in the Sandy River Basin is part of the Lower Columbia River Steelhead DPS, and is listed as threatened. The hatchery-produced summer steelhead population is not considered part of the Lower Columbia River Steelhead ESU and is not listed.

Summer-run steelhead are not considered indigenous to the Sandy River Basin, but evidence suggests they do exist, although not in self-sustaining numbers. Because there are few naturally produced summer steelhead adults, adult steelhead (South Santiam hatchery stock) returning to the South Santiam River are collected at the Foster Dam trap and used as broodstock for this program. Broodstock are held and spawned at the South Santiam Hatchery. Eggs are incubated through the eyed-stage at the South Santiam Hatchery, after which a portion is sent to both Bonneville Hatchery and Oak Springs Hatchery. Further egg incubation and juvenile rearing takes place at these two locations. Smolts are then sent to the Sandy Hatchery for final acclimation and release.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 63 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 20 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain at 2.8. Average abundance of natural-origin spawners (NOS) would increase slightly from approximately 1483 to approximately 1664. Harvest contribution of the natural and hatchery populations would go from approximately 1,316 fish to approximately 114 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observation

There is an integrated winter steelhead hatchery program that releases 160,000 smolts. This program is consistent with management as a Primary population.

There is also a segregated summer steelhead program that releases 75,000 smolts. There is no indigenous summer steelhead population. It is assumed that there is spatial and temporal separation; therefore, there appears to be little genetic or ecological effect of this program on the winter steelhead.

Broodstock is collected and juveniles are reared out-of-basin. Smolts are acclimated and released locally. The practice of out-of-basin rearing introduces additional disease risk and may reduce homing fidelity.

The upper Sandy River is managed as a wild fish management zone.

Recommendations

We have no specific recommendations to improve these programs; however, it is important to continue to evaluate methods of broodstock collection, to monitor straying and to remove surplus hatchery fish.

Monitor the assumed spatial and temporal separation of the populations.

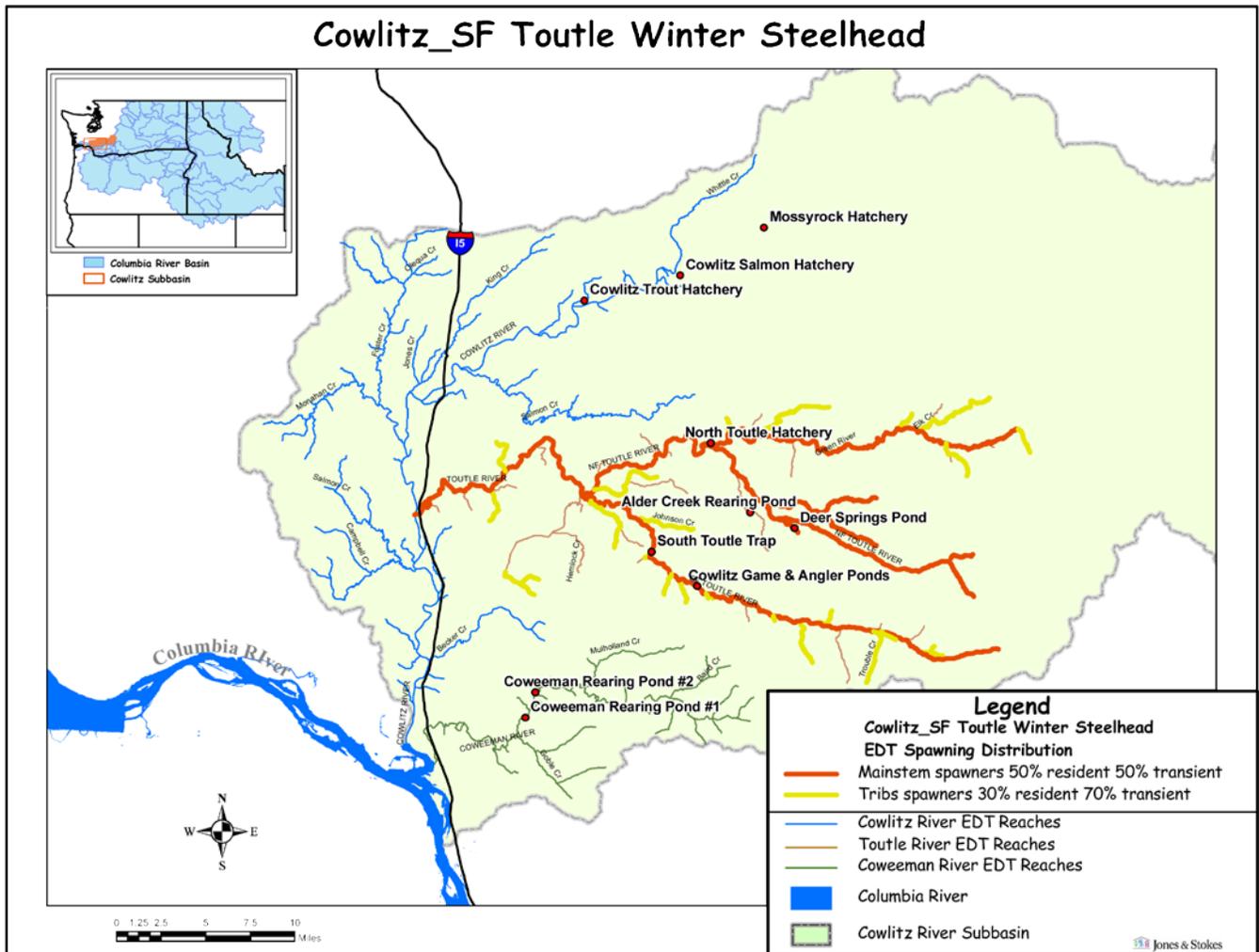
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Sandy River Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-----------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Harv | 159.9 | 92% | 0% | 3% | 0.97 | 1,483 | 2.8 | 972 | 726 |
| | Summer Stlhd Seg Harv | 75.0 | 95% | | | | | | 344 | 299 |
| No Hatchery | Int Harv | - | 0% | 0% | 0% | 1.00 | 1,664 | 2.8 | 114 | - |
| HSRG Solution | Int Harv | 159.9 | 92% | 0% | 3% | 0.97 | 1,482 | 2.8 | 972 | 726 |
| | Summer Stlhd Seg Harv | 75.0 | 95% | | | | | | 344 | 299 |
| HSRG Solution w/ Improved Habitat | Int Harv | 159.9 | 92% | 0% | 3% | 0.97 | 1,756 | 3.1 | 991 | 726 |
| | Summer Stlhd Seg Harv | 75.0 | 95% | | | | | | 344 | 299 |

Hatchery Scientific Review Group Review and Recommendations

South Fork Toutle Winter Steelhead Population and Related Hatchery Programs

January 31, 2009



1 South Fork Toutle Winter Steelhead

South Fork Toutle winter steelhead were identified as a stock based on their distinct spawning distribution. Most spawning takes place in the South Fork Toutle River and in tributaries such as Studebaker, Johnson, and Bear creeks. Spawning generally occurs from March through early June. This is a native stock with wild production. Aside from several small fry plants after the 1980 eruption of Mount St. Helens, hatchery winter steelhead have not been stocked into the South Fork Toutle River (SaSSI 2002).

Stock status was rated Depressed in 2002 because of chronically low escapements (low from 1994 to the present). An escapement goal of 1,058 fish has been established for this stock.

Genetic sampling was conducted in 1996; however, comparisons of allele frequencies between this stock and other lower Columbia steelhead stocks for determining stock distinctiveness are not very informative (Myers et al. 2002).

2 Current Conditions

2.1 Current Population Status and Goals

This is a segregated program that releases 25,000 Skamania stock smolts into the South Fork of the Toutle River.

- ESA Status: Late winter steelhead are listed as threatened and are part of the Lower Columbia River Steelhead DPS.
- Population Description: Primary
- Current Viability Rating: Medium
- Recovery Goal for Abundance: 550
- Productivity Improvement Expectation: 35%

Habitat Productivity and Capacity (from EDT): Productivity: 3.58; Capacity: 1,038

2.2 Current Hatchery Programs Affecting this Population

The program that plants 25,000 summer steelhead (Skamania origin) may affect this population. These fish are reared for a short duration in the lower subbasin. There is no hatchery winter steelhead program.

- PNI and pHOS Estimates (include straying from all hatchery programs): pHOS is 4%
- Estimated Productivity (with harvest and fitness factors effects from AHA): 2.4 for the native winter steelhead
- Projected Average Natural Origin Escapement: 678 winter steelhead
- Average Harvest Contribution: 522 hatchery summer steelhead and 39 natural winter steelhead
- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 150 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.4 to 3.3. Average abundance of natural origin spawners (NOS) would increase from 678 to 949. Harvest contribution of the natural and hatchery populations would go from 561 to 55.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The South Fork Toutle winter steelhead population is listed as a Primary population for recovery. There is no hatchery program for late winter steelhead, but there is a straying issue due to segregated summer run steelhead plants in the Toutle (in both North Fork [25,000] and South Fork [25,000] which originate from Skamania Hatchery). The South Fork Toutle has no capability to capture unharvested summer steelhead. This causes a small genetic impact, but the ecological effect may be significant. The effective pHOS currently is 4% (Kostow, 2003, 2004, 2006).

Recommendation

Due to the ecological and genetic risks from the segregated summer steelhead program on the ESA listed winter steelhead, this program should be modified in one of three ways to meet standards of a Primary population: (1) reduce the size of the hatchery program (to about 15,000 smolts); (2) manage to remove hatchery adults (increase harvest or adult trap); or (3) replace with an integrated winter run program (up to 40,000 smolts). In any case, manage acclimation and release to reduce residualism to the extent possible. If the program were retained at the current level but an additional 20% of returning adults were removed through harvest or other means, one would expect an improvement in abundance and productivity of the natural population along with reduced ecological and genetic risk while retaining harvest benefits.

This stream is a good candidate to be a wild steelhead management zone.

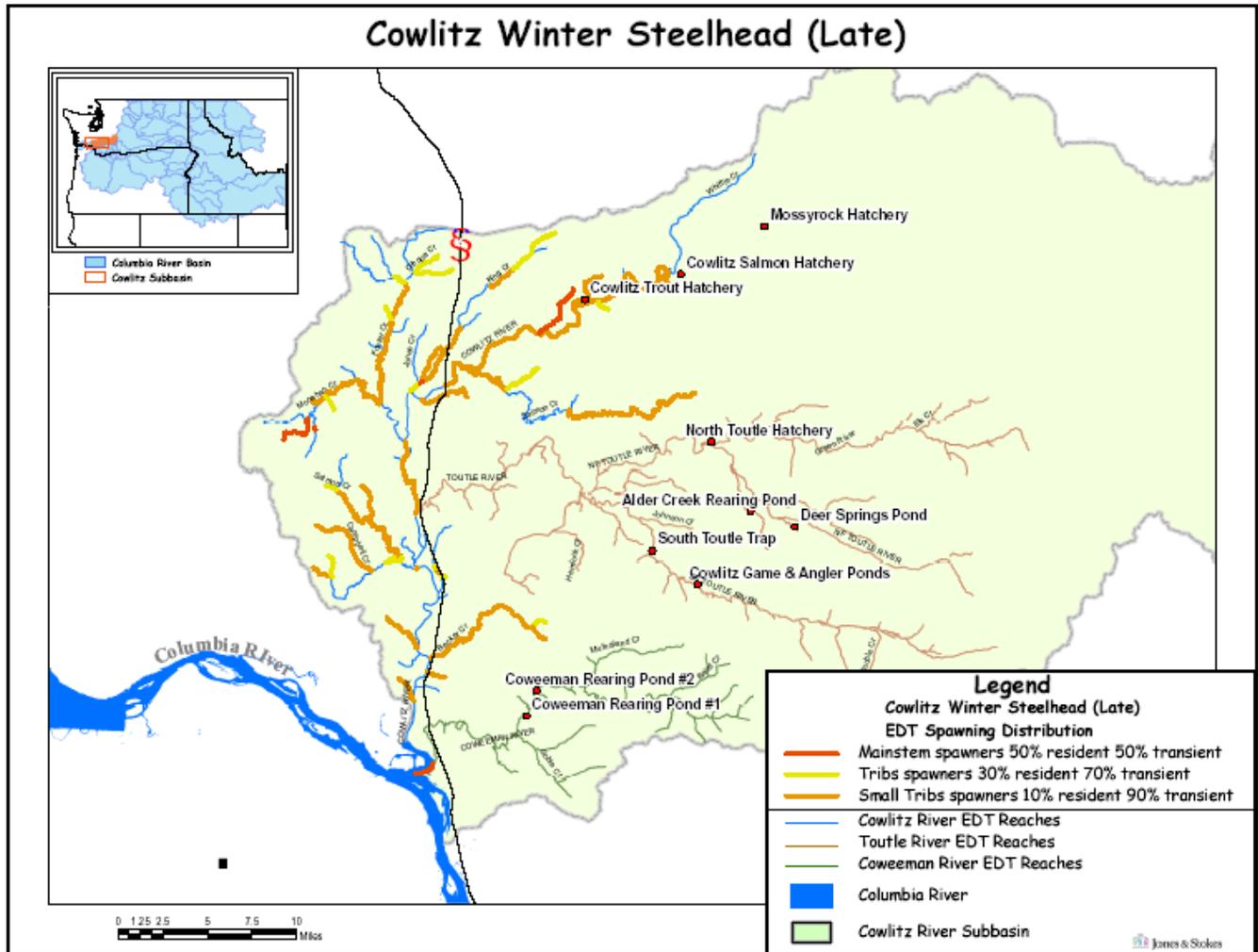
Table 1. Results of HSRG analysis of current condition and HSRG Solution for South Fork Toutle Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 4% | 0.00 | 678 | 2.4 | 39 | 0 |
| | Summer Seg Harv | 24.7 | 0% | | | | | | 522 | 1 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 949 | 3.3 | 55 | - |
| HSRG Solution | None None | - | 0% | 0% | 2% | 0.00 | 846 | 2.9 | 49 | 0 |
| | Summer Seg Harv | 23.9 | 20% | | | | | | 508 | 7 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 1,033 | 3.4 | 60 | 0 |
| | Summer Seg Harv | 23.9 | 20% | | | | | | 508 | 7 |

Hatchery Scientific Review Group Review and Recommendations

Upper Cowlitz River Winter Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Upper Cowlitz River Winter Steelhead

The Cowlitz system had six historical populations that included three core populations (Cispus, Upper Cowlitz and North Fork Toutle). Three mainstem dams on the Cowlitz River have blocked access to all historical habitat for this population. The Upper Cowlitz population is now being reintroduced: late winter steelhead have been transferred upstream since 1996. In 2004, 35,032 steelhead smolts were collected at the Cowlitz Falls Fish Facility, of which 11,276 (32%) were of wild origin. Fry plants identified by right ventral clip contribute to the escapement, while yearling plants of right ventral and adipose fin clips (37,500) provide some level of harvest on identified steelhead for the upper basin.

2 Current Conditions

2.1 Current Population Status and Goals

The native late stock winter steelhead are ESA-listed as threatened. The lower Cowlitz supports substantial summer and winter steelhead fisheries based on other hatchery programs. Significant winter steelhead habitat exists in the upper Cowlitz above Cowlitz Falls Dam, to which adult fish are transported. This separation and transportation effort allows managers to remove any number of hatchery fish from this upper habitat. The upper basin can therefore be managed for native fish recovery regardless of management policies in the lower basin.

- ESA Status: Native Cowlitz late winter steelhead are listed as threatened and are part of the Lower Columbia River Steelhead DPS.
- Population Description: Contributing
- Current Viability Rating: Very Low
- Recovery Goal for Abundance: Unknown
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity (from EDT): Productivity: 1.26; Capacity: 1,060

2.2 Current Hatchery Programs Affecting this Population

The current program releases approximately 75,000 smolt and 200,000 parr into the upper basin. These fish are of late winter hatchery-origin. Parr are marked with ventral fin-clip. All recovered adults are passed upstream. Also, unmarked late-timed adult steelhead captured at the Cowlitz Fish Hatchery are passed upstream.

- PNI and pHOS Estimates (include straying from all hatchery programs): PNI is 0.0 and pHOS is 0%
- Estimated Productivity (with harvest, fitness factors and a 40% FGE at Cowlitz Falls from AHA): 1.2
- Projected Average Natural Origin Escapement: 239 into the upper Cowlitz
- Average Harvest Contribution: 35 late winter steelhead
- Hatchery strays from in-basin integrated hatchery program – from AHA summary: 2
Hatchery strays from in-basin segregated and out-of-basin hatchery programs – from AHA summary: 0

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain the same at 1.2. Average abundance of natural origin spawners (NOS) would remain the same at approximately 350 fish. Harvest contribution of the natural and hatchery populations would go from approximately 30 fish to approximately 20 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This is a reintroduction program releasing smolts and parr into the upper basin. These fish are of late winter hatchery-origin. Parr are marked with ventral fin-clips. With a recruit/spawner estimate of 0.2, the parr releases do not appear to be successful at producing adult returns. All recovered adults are passed upstream. Also, unmarked late-timed adult steelhead captured at the Cowlitz Fish Hatchery are passed upstream. Even with juvenile fish collection efficiency estimated at 40%, it appears that the re-introduction is being successful and this population may be able to sustain itself. Natural-origin adult returns from the re-introduction efforts have increased annually from less than 300 adults (2004) to 544 and 622 adults in 2006 and 2007, respectively.

Recommendations

The HSRG has two alternatives for this program depending on the ability of this population to sustain itself. If the population is achieving levels of productivity and fish passage that can lead to sustainability, hatchery programs in the upper Cowlitz River should be suspended and testing for self-sustainability should begin. This would include suspending the introduction of adults from the current lower river segregated program. If these points have not yet been reached, we recommend modifying the current program to an integrated conservation program (PNI = 0.72) taking 100% natural-origin broodstock (50 adults) from fish returning to the upper Cowlitz. Approximately 100,000 smolts derived from this broodstock would be released below the barrier dam to improve survival over the current approach of releasing juveniles in the upper watershed. Upon return, all adults from this program would be transported to the upper watershed and be allowed to distribute themselves and spawn naturally.

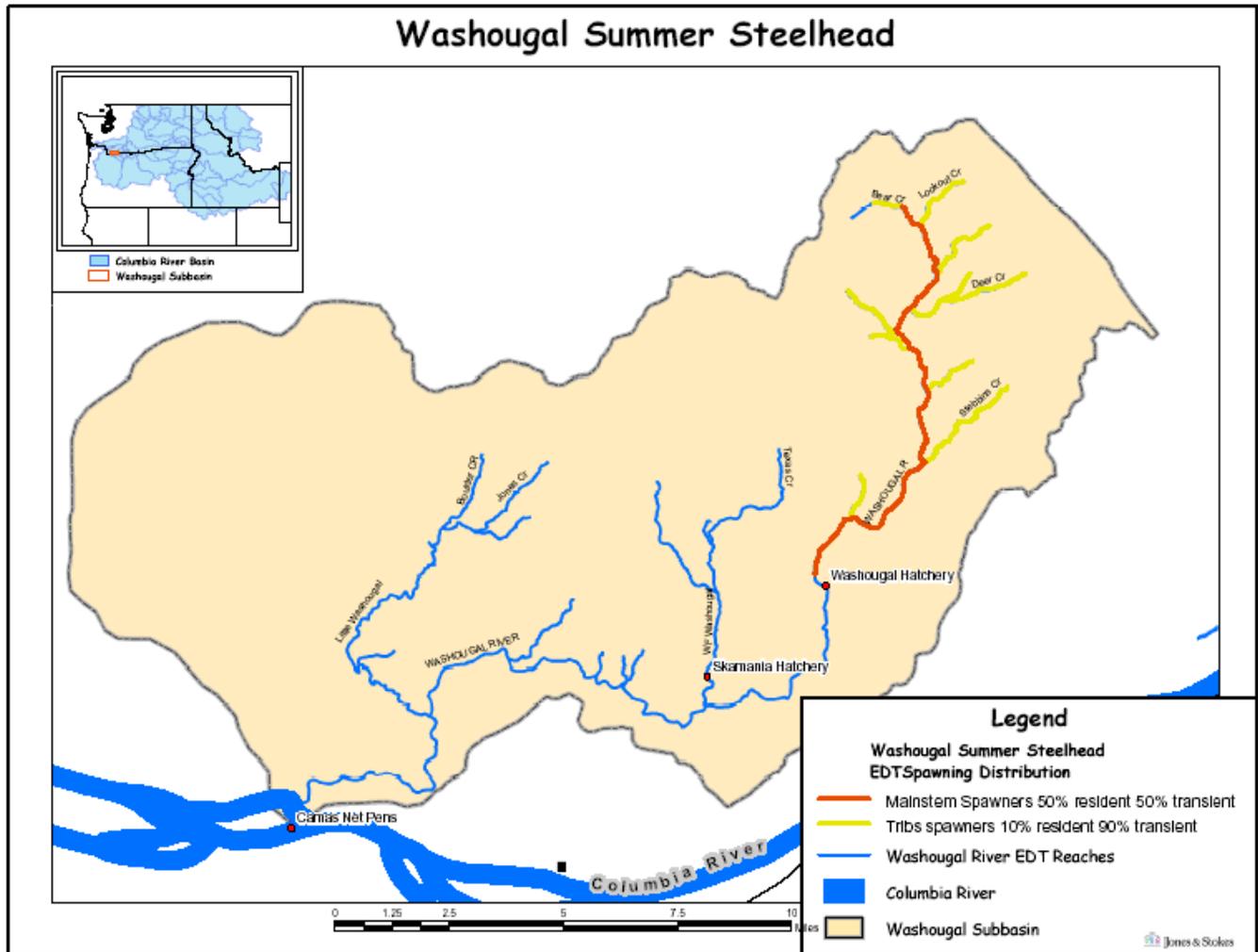
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Upper Cowlitz Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Harv | 199.1 | 75% | 100% | 0% | 1.00 | 354 | 1.2 | 34 | 9 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 0.00 | 354 | 1.2 | 21 | - |
| HSRG Solution | Int Harv | 99.3 | 0% | 0% | 39% | 0.72 | 559 | 1.0 | 724 | 1 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Harv | 99.3 | 0% | 0% | 35% | 0.74 | 659 | 1.1 | 730 | 1 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Washougal River Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Washougal River Summer Steelhead

The Washougal summer steelhead population is included in the Lower Columbia River steelhead DPS. The broodstock was derived from wild fish taken from the Washougal and Klickitat rivers. Washougal summer steelhead were identified as a stock based on their distinct spawning distribution and early run timing. Spawning takes place in the Washougal River and in its forks and tributaries from early March through early June. The stock status was rated Unknown in 2002 and an escapement goal of 1,210 fish has been established (SaSSI, 2002).

Genetic sampling was conducted in 1993; however, comparisons of allele frequencies between this stock and other lower Columbia steelhead stocks for determining stock distinctiveness are not very informative (Myers et al. 2002).

2 Current Conditions

2.1 Current Population Status and Goals

- ESA Status: This population is listed as threatened and is part of the Lower Columbia Steelhead DPS.
- Population Description: This population is designated a Primary population (LCSR&SP 2004).
- Current Viability Rating: Medium
- Recovery Goal for Abundance: 500 adults annually
- Productivity Improvement Expectation: 30%
- Habitat Productivity and Capacity (from EDT): Productivity: 4.27; Capacity: 585

2.2 Current Hatchery Programs Affecting this Population

The broodstock for the current program is of Washougal/Klickitat origin. Adults are captured from volitional returns to the Skamania Hatchery, where incubation and rearing occur. The program currently releases 60,000 smolts into the North Fork and mainstem Washougal River. All releases are adipose-clipped. The program is a segregated-harvest program. Approximately 450,000 summer steelhead eggs are produced at Skamania Hatchery and transferred to other Washington State programs.

- PNI and pHOS Estimates (include straying from all hatchery programs): The pHOS value for the current program is 5%; PNI was not calculated.
- Estimated Productivity (with harvest and with fitness factors from AHA): 2.5
- Projected Average Natural Origin Escapement: 347 fish
- Average Harvest Contribution: 1,217 fish

The estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 113 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.5 to 3.8. Average abundance of natural origin spawners (NOS) would increase from 347 to 533. Harvest contribution of the natural and hatchery populations would go from 1,217 to 57.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Washougal has an indigenous population of summer steelhead that has been designated as a Primary population. There are two segregated harvest programs that affect this population. One program for Skamania Hatchery stock summer run steelhead, releases approximately 60,000 smolts that produce enough adults to support the in-basin program and harvest objectives in the basin as well as the export of 450,000 eggs for release at many locations around the region. The other program is a 60,000 smolt segregated Skamania early winter steelhead program that supports the in-basin program as well harvest goals and provides 250,000 eggs/smolts for export to other locations around the region.

The ecological effects may be significant under the current program. Even though the program meets the genetic guidelines (effective pHOS equals 5%), the actual proportion of hatchery fish on the spawning ground exceeds 30% (see Kostow, 2003, 2004, 2006).

Recommendations

Reduce the existing segregated hatchery program to a 20,000 to 30,000 smolt release to continue to support summer steelhead harvest programs in other watersheds. Develop an integrated summer steelhead program that can maintain harvest benefits lost from the reduction of the segregated program as well as provide a demographic benefit for this primary population (up to approximately 100,000 smolt release with a pNOB of 100%). Manage releases to reduce residualism and recapture unharvested adults to the extent possible.

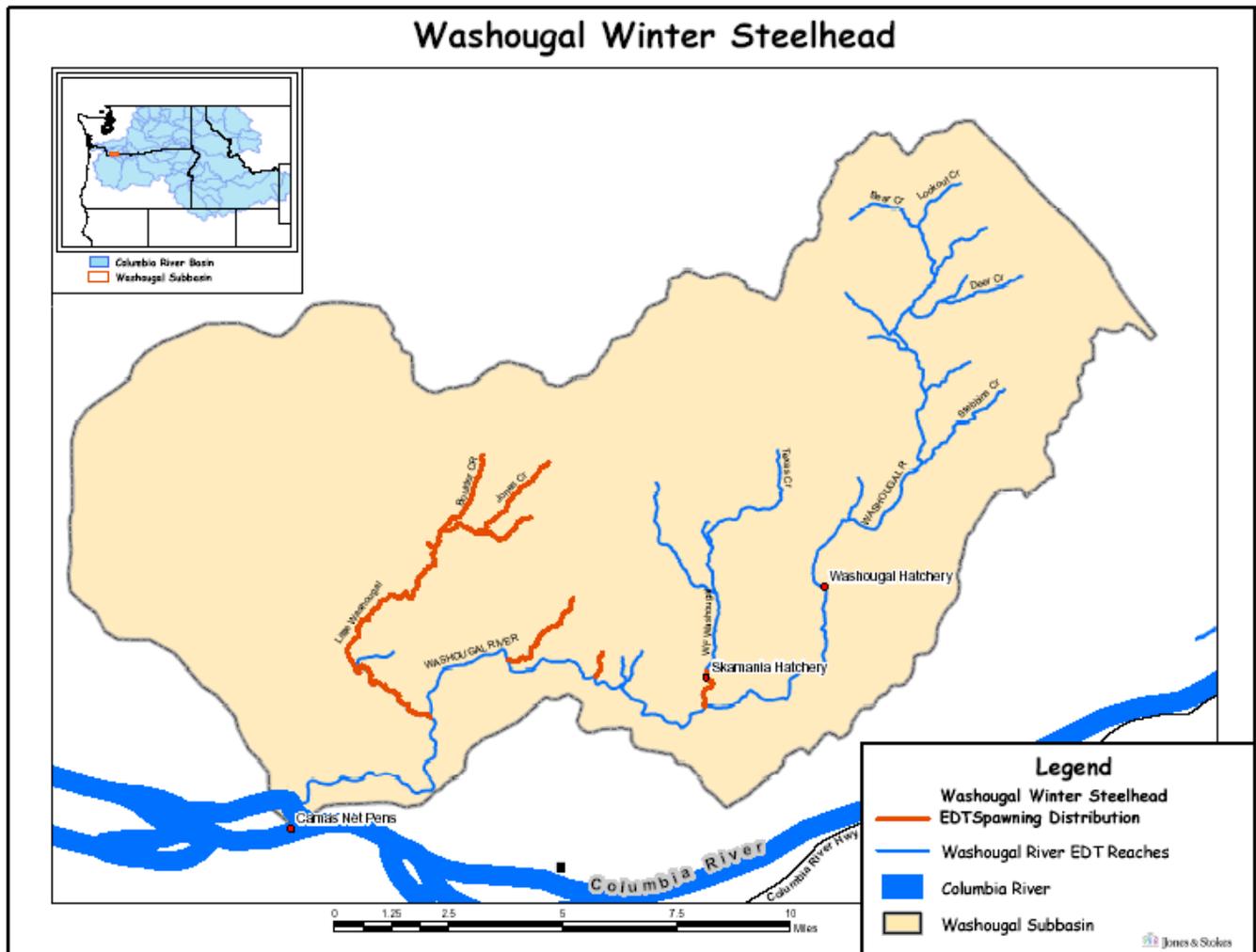
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Washougal Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 75% | 0% | 5% | 0.00 | 347 | 2.5 | 37 | 0 |
| | Seg Harv | 60.3 | 75% | | | | | | 1,180 | 98 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 533 | 3.8 | 57 | - |
| HSRG Solution | Int Harv | 100.4 | 90% | 0% | 14% | 0.88 | 428 | 3.7 | 2,019 | 711 |
| | Seg Harv | 28.7 | 90% | | | | | | 562 | 184 |
| HSRG Solution w/ Improved Habitat | Int Harv | 100.4 | 90% | 0% | 12% | 0.89 | 500 | 4.1 | 2,027 | 711 |
| | Seg Harv | 28.7 | 90% | | | | | | 562 | 184 |

Hatchery Scientific Review Group Review and Recommendations

Washougal River Winter Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Washougal River Winter Steelhead

The “late” winter steelhead population is thought to be effectively segregated (with respect to spawning) from the “early” winter steelhead that are propagated at the Skamania Hatchery. The late winter steelhead population in the Washougal River is considered endemic and included in the Lower Columbia DPS.

Washougal winter steelhead were identified as a stock based on their distinct spawning distribution and later run timing. Spawning takes place in the mainstem Washougal River, its forks and tributaries from early March through early June.

No genetic analysis has been done on Washougal winter steelhead.

2 Current Conditions

2.1 Current Population Status and Goals

- ESA Status: This population is listed as threatened and is part of the Lower Columbia Steelhead DPS.
- Population Description: The late winter Washougal steelhead population is designated as a Contributing population (LCSR&SP 2004).
- Current Viability Rating: Low+
- Recovery Goal for Abundance: 350
- Productivity Improvement Expectation: 15%
- Habitat Productivity and Capacity (from EDT): Productivity: 3.87; Capacity: 522

2.2 Current Hatchery Programs Affecting this Population

There is currently no hatchery program associated with this population. However, an early-winter run steelhead program that is based on a broodstock that has been heavily influenced by introductions of out-of-basin steelhead does operate out of the Skamania Hatchery on the Washougal River. The late-run winter steelhead population discussed in this narrative is effectively segregated from this hatchery program. Integrated options discussed in this narrative for the late-natural steelhead population rely on taking fish from this late, natural component (not the early-hatchery component) into the hatchery.

- PNI and pHOS Estimates (include straying from all hatchery programs): The pHOS value for the current program is 1%; PNI was not calculated.
- Estimated Productivity (with harvest and fitness factor effects from AHA): 3.0
- Projected Average Natural Origin Escapement: 336 adults
- Average harvest contribution: 305 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 3.0 to 3.3. Average abundance of natural origin spawners (NOS) would increase from 336 to 372. Harvest contribution of the natural and hatchery populations would go from 305 to 61.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Washougal has an indigenous population of winter steelhead that has been designated as a Contributing population. There are two segregated harvest programs that affect this population (a Skamania Hatchery stock summer run steelhead program releasing approximately 60,000 smolts that produce enough adults to support the in-basin program and harvest objectives as well as the export of 450,000 eggs for release at many locations around the region. In addition, there is a 60,000 smolt segregated Skamania early winter steelhead program that supports this in-basin program as well as harvest goals and provides 130,000 eggs/smolts for export to other locations around the region. This population has room for increased hatchery production.

Recommendations

The HSRG recommends continuing the segregated early winter hatchery program to support segregated programs in other basins. The HSRG has no specific recommendations to improve this program.

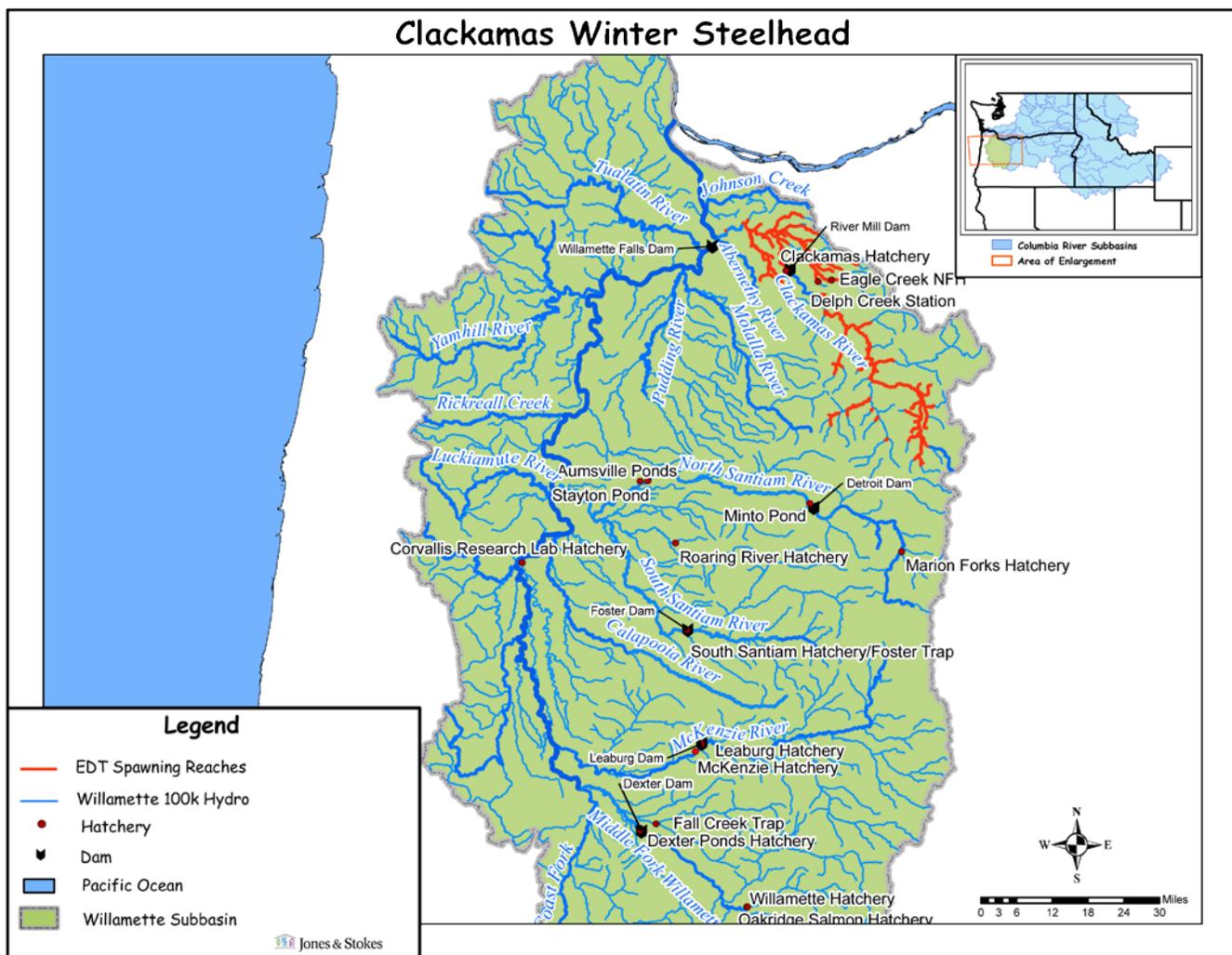
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Washougal Winter Steelhead (Late-Natural). The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 75% | 0% | 1% | 0.00 | 336 | 3.0 | 55 | 0 |
| | Seg Harv | 59.4 | 75% | | | | | | 250 | 13 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 372 | 3.3 | 61 | - |
| HSRG Solution | None None | - | 90% | 0% | 1% | 0.00 | 367 | 3.2 | 60 | 0 |
| | Seg Harv | 63.0 | 90% | | | | | | 265 | 10 |
| HSRG Solution w/ Improved Habitat | None None | - | 90% | 0% | 1% | 0.00 | 421 | 3.6 | 69 | 0 |
| | Seg Harv | 63.0 | 90% | | | | | | 265 | 10 |

Hatchery Scientific Review Group Review and Recommendations

Willamette – Clackamas Winter Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Clackamas Winter Steelhead

This population represents native late winter steelhead naturally spawning in the Clackamas River above and below the North Fork Dam and major tributaries, including Deep, Clear and Eagle creeks. In addition, this population includes steelhead spawning in lower Willamette River tributaries, such as Johnson and Tryon creeks. Steelhead in these tributaries are part of the Lower Columbia River Steelhead ESU, but have not been identified as an independent population.

The Clackamas River population is one of five winter steelhead populations in Oregon's portion of the Lower Columbia River Steelhead ESU. Clackamas steelhead are managed differently above and below North Fork Dam. The lower component includes hatchery strays from the three steelhead programs operating in the basin; however, very few to none are found in the tributaries other than Eagle Creek (personal communication, Todd Alsbury, ODFW, January 2008). The upper river component is managed as a wild fish sanctuary. Marked hatchery steelhead (early-timed winter run, late-timed winter run, and summer steelhead) are not passed upstream of North Fork Dam.

There is little data regarding the population status of late winter steelhead in the lower Willamette tributaries. The Johnson Creek winter steelhead component spawns in mainstem Johnson Creek and its tributaries and the Tyron Creek component (including Arnold Creek) historically spawned at least up to the Marshall Cascade. The life history of the Johnson Creek steelhead is based on other lower Willamette winter steelhead, notably steelhead in the Clackamas River and Tryon Creek that are believed to be late-run populations returning to freshwater and spawning during their fifth and sixth years.

McElhany et al. (2007 review draft) reviewed the winter steelhead population in the entire Clackamas River subbasin, comprising both the Lower and Upper Clackamas late winter steelhead components. The population long-term geometric mean is about 1,800 natural origin spawners, which is in the very low risk minimum abundance threshold category (McElhany et al. 2007 review draft). For comparison, the abundance in recent years of returning adults to North Fork Dam has been several hundred to a few thousand, although the long-term average is approximately 450 (Subbasin Plan). In recent years (1990-2005), the geometric mean of natural-origin spawners was 1,168, with a recent hatchery fraction of about 0.25 (McElhany et al. 2007 review draft). Over the same period, the geometric mean recruits per spawner was 0.617. The 25% average recent hatchery fraction makes it difficult to obtain a precise estimate of population productivity for wild fish only.

Virtually the entire historic habitat accessible to winter steelhead in the Clackamas River remains accessible today (ODFW 2005). Losses of accessibility are limited to higher order tributary streams, primarily due to watershed development in the lower basin. Spatial structure has likely been reduced by habitat degradation in lower basin tributaries (McElhany et al. 2007 – review draft).

In the lower Columbia River, most wild steelhead are 4 to 6 years of age at first spawning (Busby et al. 1996). Abernethy (1886) reported that steelhead entered the river from December 1st to February 15th. Currently, Clackamas River winter steelhead enter the river from February through May and spawn from May to June (Murtagh et al. 1992). Olsen et al. (1992) reported that prior to the introduction of early-winter (Big Creek) steelhead, passage at North Fork Dam peaked in May. The majority of steelhead return at 4 years of age, with a repeat spawning incidence of 11% (Chilcote 2001). The apparent change in run timing may be due to a number of factors – further investigation is needed.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Clackamas River Winter Steelhead are part of the Lower Columbia Steelhead DPS which was listed as Threatened under the ESA in 1998.
- **Population Description:** The entire Clackamas River Winter Steelhead (Late) population is designated as a Primary population in the Lower Columbia Salmon Recovery and Subbasin Plan (LCSR&SP 2004). The LCSR&SP describes current viability as NA with a viability goal of High.
- **Recovery Goal for Abundance:** The recovery goal is NA; the current abundance for the entire Clackamas late winter steelhead population (both upper and lower) is 277; the viable abundance is 1,000, and the potential abundance is 2,000.
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (e.g., from EDT) – Upper Clackamas:** Productivity: 10.1; Capacity: 3,345. **Lower Clackamas:** Productivity: 3.1; Capacity: 1,134.

2.2 Current Hatchery Programs Affecting this Population

There are three hatchery programs of steelhead released into the Clackamas River, late-winter (integrated), early-winter (segregated), and summer run (segregated). Since 1999, only unmarked steelhead have been allowed above North Fork Dam, although prior to that the hatchery contribution was about 25% of the run.

Clackamas River Hatchery Winter Steelhead (Late) integrated harvest/conservation program: The Clackamas Hatchery winter steelhead (#122) derived from late returning “native” spawners is the only hatchery stock considered part of the ESU (SHAGG 2003). The ODFW Clackamas Hatchery currently rears a winter run broodstock (#122) developed from unmarked fish at North Fork Dam. In 2003, 18 females and 32 males were spawned (including 25 unmarked fish) at the Clackamas Hatchery for the “wild” broodstock. Under this program, approximately 165,000 yearling late winter steelhead are released into the Clackamas River each year (HGMP 2001). Due to water quality and quantity limitations at the hatchery, a portion of the program involves out-of-basin incubation and rearing at other hatchery facilities. Approximately 115,000 smolts are released at the Clackamas Hatchery, 25,000 smolts are acclimated and released at the Cassidy acclimation site, and 25,000 smolts are acclimated and released at the Foster site.

Eagle Creek NFH Winter Steelhead (Early) segregated harvest program: The Big Creek Hatchery stock of early winter steelhead return to the Clackamas River earlier (from November to early March) than the native winter steelhead, which arrive from February to June (Murtagh et al. 1992). Furthermore, the peak spawning period for Big Creek-derived fish is January to early March compared with May and June for native Clackamas River winter steelhead. Under this program, approximately 150,000 yearling early winter steelhead are volitionally released onsite (Eagle Creek) April through May of each year (HGMP 2004).

Clackamas River Hatchery Summer Steelhead (South Santiam) segregated harvest program: This program releases a proposed 175,000 summer steelhead from the Clackamas

Hatchery. Average release for brood years 1996 to 2001 were 153,000 smolts. Adult South Santiam Hatchery stock steelhead returning to the South Santiam River are collected at the Foster Dam trap and used as broodstock for this program. Broodstock are held and spawned at the South Santiam Hatchery. Eggs are incubated through the eyed-stage at the South Santiam Hatchery, and then are sent to Bonneville Hatchery where further egg incubation and juvenile rearing takes place. Smolts (at 5 fish/lb) are then sent to the Clackamas Hatchery for final acclimation and release (HGMP 2006). The introduction of early-winter and summer steelhead from outside of the basin may have influenced the diversity of the native late-winter run, although differences in run timing probably limit the degree of introgression. Chilcote (2001) estimated that competition between summer and winter-run steelhead probably reduced the productivity of the winter run population, but it is not know if there has been any effect on life history diversity.

Estimated number of hatchery strays affecting the lower Clackamas population component:

- Hatchery strays from in-basin integrated hatchery program: 373 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 80 fish.

Estimated number of hatchery strays affecting the upper Clackamas population component:

- Hatchery strays from in-basin integrated hatchery program: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 5 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.5 to 3.0 in the lower Clackamas and would not change in the upper Clackamas. Average abundance of natural-origin spawners (NOS) would increase from approximately 520 fish to approximately 800 fish in the lower Clackamas and would not change in the upper Clackamas. Harvest contribution of the natural and hatchery populations would go from approximately 4,000 fish to approximately 150 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Native Clackamas steelhead are considered a single population with two components (lower river and upper river). The single population meets the criteria for a Primary designation with the current hatchery program. The two components are managed as separate units upstream and downstream, respectively, of North Fork Dam.

Recent management changes affecting the upper river component have included the following measures: removing adult summer run steelhead; terminating rainbow trout releases into spawning and rearing habitat; terminating releases of hatchery-origin summer steelhead smolts; terminating harvest above North Fork Dam; planting only adipose-marked rainbow trout into reservoirs; and allowing the retention of only marked rainbow trout in the fishery. These measures likely are leading to strengthening of natural steelhead escapement to the basin. Managers estimate that approximately 70% of existing steelhead habitat is above North Fork Dam, an area that has been designated a wild fish sanctuary.

Lower River Component: The lower river component is heavily hatchery dominated. Currently, the hatchery programs (150,000 segregated early winter steelhead smolts from Eagle Creek National Fish Hatchery, 175,000 summer steelhead smolts outplanted from North Santiam Hatchery, and 165,000 upper river integrated winter steelhead smolts from Clackamas Hatchery) in the lower river are operated consistent with a stabilizing population (for recovery planning purposes).

Upper River Component: The upper river (upstream of the North Fork Dam) is managed for wild fish production. There appears to be little or no straying of hatchery fish into this area because of selective removal of all marked hatchery fish at North Fork Dam. The existing program at Clackamas Hatchery includes natural-origin broodstock from this upriver population (released into the lower river) and is operated consistent with a primary population designation.

Alternative Management Strategies for the Lower River Component

Stabilizing Designation: Should it be determined to manage the lower river component consistent with a stabilizing designation, the upper river component still could meet the standards of a primary designation. The lower river population component could be managed to maintain the current segregated (early winter and summer) and integrated (winter) programs.

Contributing Designation: Should it be determined to manage the lower river component consistent with a contributing designation, the upper river component still could meet the standards of a primary designation. Two alternatives are available for the lower river population component:

- 1) Maintain current segregated programs (early winter and summer), eliminate the current integrated program, and develop an integrated program with broodstock that spawn in the lower river of approximately the same size at the existing program (164,000 smolts); or,
- 2) Eliminate the current segregated programs (early winter and summer) and continue a significantly smaller integrated program (approximately 30,000 smolts) with current broodstock protocols (using upper river component).

Primary Designation: Should it be determined to manage the lower river component consistent with a primary designation, two alternatives are also available:

- 1) Maintain the current segregated programs and eliminate the current integrated program; or,
- 2) Eliminate the current segregated programs and develop an integrated program using brood stock collected in the lower river of approximately 80,000 smolts to replace the existing integrated program.

All of the above-listed management options for the lower river component will continue to meet the standards for a Primary designation for the steelhead population as a whole because of the viability and abundance of the upper river component.

Recommendations

The HSRG's recommendations for the Lower River component are captured in the alternative strategies identified above. Selecting a specific strategy will depend on the goals of the Oregon component of the Lower Columbia Recovery Plan that is currently under development.

In order to increase long-term survival of the segregated summer steelhead population, develop within basin broodstock of South Santiam origin. Because the program uses over 100 breeders annually, under this segregated option, a local broodstock with a sufficiently high effective population size could be developed from fish returning to the Clackamas River.

The ecological effect (and potential genetic effect) of introduced summer steelhead on natural populations of winter steelhead in the lower river however is a concern (Kostow 2004, Kostow and Zhou 2006). All of the options proposed above represent a reduced genetic and ecological risk to natural populations. After specific program options are selected, the HSRG recommends periodical assessments of the ecological risks under those updated programs. In any case, manage acclimation and release to reduce residualism and recapture unharvested adults to the extent possible.

Upper River Population Component: Current management of the upper river component is consistent with a primary population designation and the HSRG sees no conservation need for direct hatchery intervention in the upper watershed at this time. If the long-term management goal is to treat natural populations of steelhead in the Clackamas River as one genetic stock, then managers should consider collecting broodstock from areas in the lower river to augment current collections from the upper river at

North Fork Dam (integrated program). These expanded collections would ensure the current integrated hatchery program at the Clackamas Hatchery more accurately represents the spawning aggregates found throughout the basin.

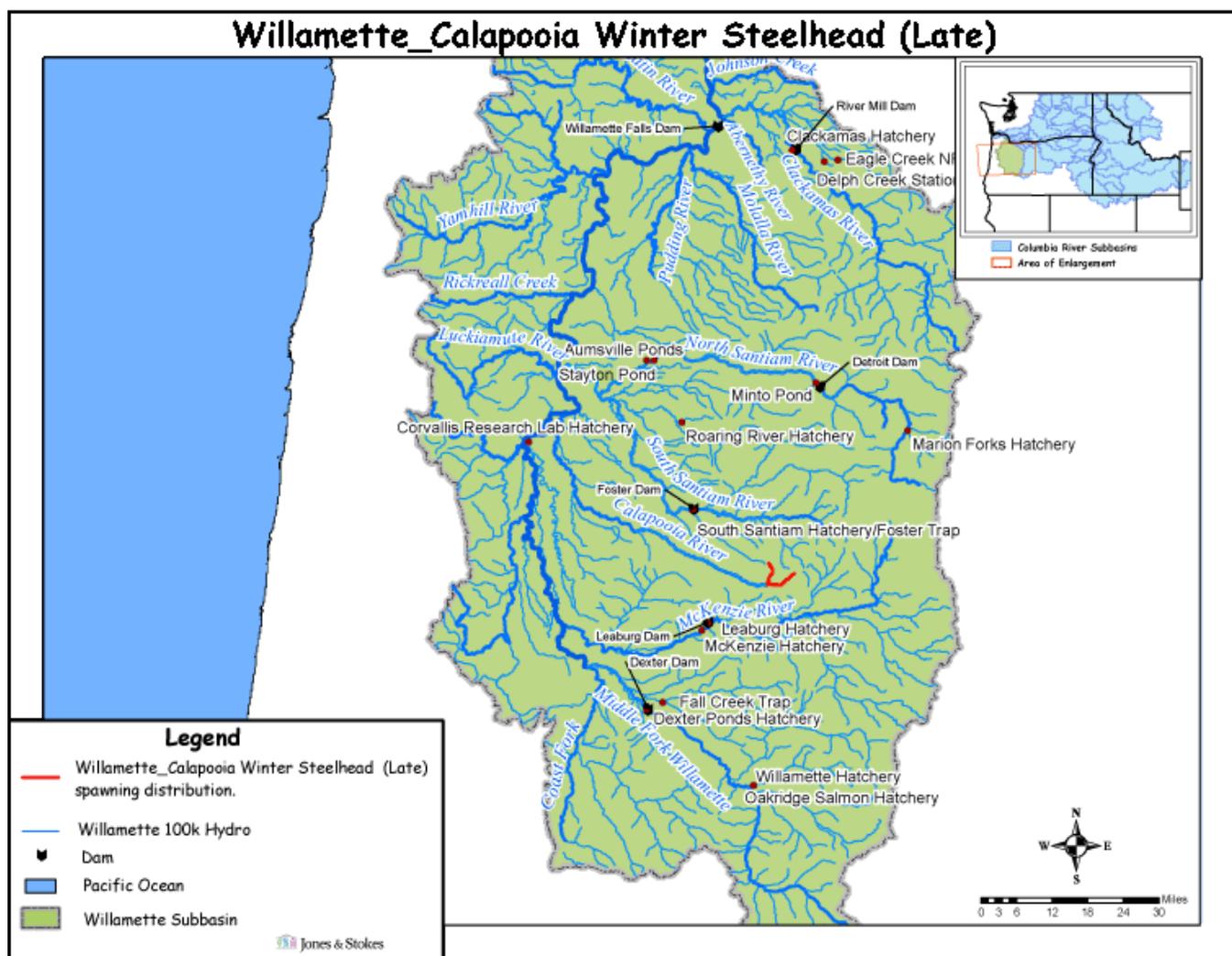
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Clackamas Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|---------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Upper Clackamas None None | - | 90% | 95% | 0% | 1.00 | 3,222 | 9.7 | 116 | - |
| | Lower Clackamas Int Harv | 164.9 | 80% | 0% | 37% | 0.00 | 527 | 1.5 | 2,273 | 1,370 |
| | Eagle Creek Seg Harv | 151.0 | 90% | | | | | | 1,016 | 647 |
| | Summer Stlhd Seg Harv | 174.8 | 90% | | | | | | 724 | 712 |
| No Hatchery | Upper Clackamas None None | - | 0% | 95% | 0% | 1.00 | 3,223 | 9.7 | 116 | - |
| | Lower Clackamas Int Harv | - | 0% | 0% | 0% | 1.00 | 800 | 3.0 | 33 | - |
| HSRG Solution | Upper Clackamas None None | - | 90% | 95% | 0% | 1.00 | 3,223 | 9.7 | 116 | 0 |
| | Lower Clackamas Int Harv | 80.4 | 80% | 0% | 17% | 0.70 | 743 | 2.5 | 1,130 | 693 |
| | Eagle Creek Seg Harv | 151.0 | 90% | | | | | | 1,016 | 647 |
| | Summer Stlhd Seg Harv | 174.8 | 90% | | | | | | 724 | 712 |
| HSRG Solution w/ Improved Habitat | Upper Clackamas None None | - | 90% | 95% | 0% | 1.00 | 3,582 | 10.7 | 129 | 0 |
| | Lower Clackamas Int Harv | 80.4 | 80% | 0% | 15% | 0.72 | 864 | 2.9 | 1,135 | 693 |
| | Eagle Creek Seg Harv | 151.0 | 90% | | | | | | 1,016 | 647 |
| | Summer Stlhd Seg Harv | 174.8 | 90% | | | | | | 724 | 712 |

Hatchery Scientific Review Group Review and Recommendations

Willamette – Calapooia Winter Steelhead (Late) Population and Related Hatchery Programs

January 31, 2009



1 Calapooia Winter Steelhead (Late)

This population represents native late-run winter steelhead spawning within the Calapooia River subbasin. The Upper Willamette Steelhead ESU consists of four populations: Molalla, North Santiam, South Santiam, and Calapooia. It is generally agreed that steelhead did not historically emigrate farther upstream than the Calapooia River (Fulton 1970). The Westside Tributaries represent an area intermittently used by steelhead, which may be important for ESU recovery, but is not considered to have historically been an independent population (Myers et al. 2006; McElhany et al. 2007 review draft). Although steelhead in this ESU are depressed from historical levels, all of the historical populations remain extant with moderate numbers of wild steelhead produced each year. However these populations have been adversely affected by the alteration and loss of spawning and rearing habitat associated with hydropower development.

Steelhead returning to the Calapooia subbasin do not have the access to potential production areas that they had historically (McElhany et al 2007 review draft). In addition, habitat degradation has substantially reduced the spatial distribution of suitable steelhead habitat within the accessible area. It should be noted that some of the blocked habitat may not have been historically used by winter steelhead. A time series of redds-per-mile data from the Calapooia shows a declining trend from 1980 to 2001 (WCS BRT 2003). Based on indices of wild steelhead spawner abundance for the five Upper Willamette winter steelhead subpopulations, Chilcote (1998) determined that the Calapooia subbasin meets the criteria for endangered classification (more than a 20 percent chance of extinction in 20 years) (Subbasin Plan).

Willis et al. (1960) reported that both live and dead steelhead were observed in the Calapooia River on May 12, 1958, as were 427 redds. In 1993, spawner density estimates for the Calapooia River were at a record low of 1.8 spawners per mile (Chilcote 1997). The average escapement of late-run winter steelhead to the Calapooia River reached critically low levels during the mid-1990s (1993-1997) with returns of only 61 fish (ODFW 1998). In the last four years escapement has reached several hundred fish (427) (Goodson 2005; McElhany et al 2007 review draft).

Currently, the Calapooia late winter steelhead population is small, with a long-term (1980-2005) geometric mean natural-origin spawner of 458 and a recent (1990-2005) geometric mean of 339 (McElhany et al 2007 review draft). Over the recent period, the geometric mean recruits-per-spawner was 2.163, with a hatchery fraction of zero. The pre-harvest viability curve analyses suggest that the population is probably viable if harvest levels remain low (McElhany et al 2007 review draft). The escapement viability curves suggest that the harvest pattern observed over the course of the time series is likely sustainable; the harvest rate over the recent period was 0.099.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Calapooia Winter Steelhead (late) are part of the Upper Willamette River Steelhead ESU, which was listed as Threatened under the ESA on March 25, 1999; the threatened status was reaffirmed January 5, 2006.
- **Population Description:** The Calapooia Winter Steelhead (late) population has not been assigned a designation by the TRT. This population was given a Contributing designation for the HSRG review.

- Recovery Goal for Abundance: Unknown
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity (e.g., from EDT): Productivity: 4.05, Capacity: 661

2.2 Current Hatchery Programs Affecting this Population

There are currently no hatchery steelhead programs in the Calapooia River subbasin. Chilcote (1997) estimates that hatchery fish (predominately strays from other Upper Willamette River DIPs) constitute less than 5% of escapement (McElhany et al 2007 review draft).

Since Willamette Falls was laddered in the early 1900s, hatchery stocks of summer and early-run winter steelhead have also been introduced into the Upper Willamette River from other ESUs. In 1982, it was estimated that 15% of the late-run winter steelhead ascending Willamette Falls were of hatchery origin (Howell et a. 1985). All of the hatchery programs for steelhead were discontinued in the late 1990s, except for summer steelhead programs in the North Santiam, South Santiam, McKenzie, and Middle Fork Willamette rivers. Winter steelhead are not native to the McKenzie or the Middle Fork Willamette rivers. Currently the only strays into the Calapooia River are likely from summer steelhead programs in the McKenzie and Santiam rivers. The incidence of stray hatchery fish, summer-run steelhead, or winter-run steelhead from other basins in the Upper Willamette River is thought to be low, although given the low escapement, even a few fish could have a significant influence on the population (McElhany et al 2007 review draft).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 74 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 3.5 to 4.2. Average abundance of natural-origin spawners (NOS) would increase from approximately 560 fish to approximately 620 fish. Harvest contribution of the natural and hatchery populations would go from approximately 17 fish to approximately 19 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population appears to meet the standards for a Contributing designation. There is no hatchery program in this subbasin.

Recommendations

Periodically monitor the contribution of hatchery strays to the natural population.

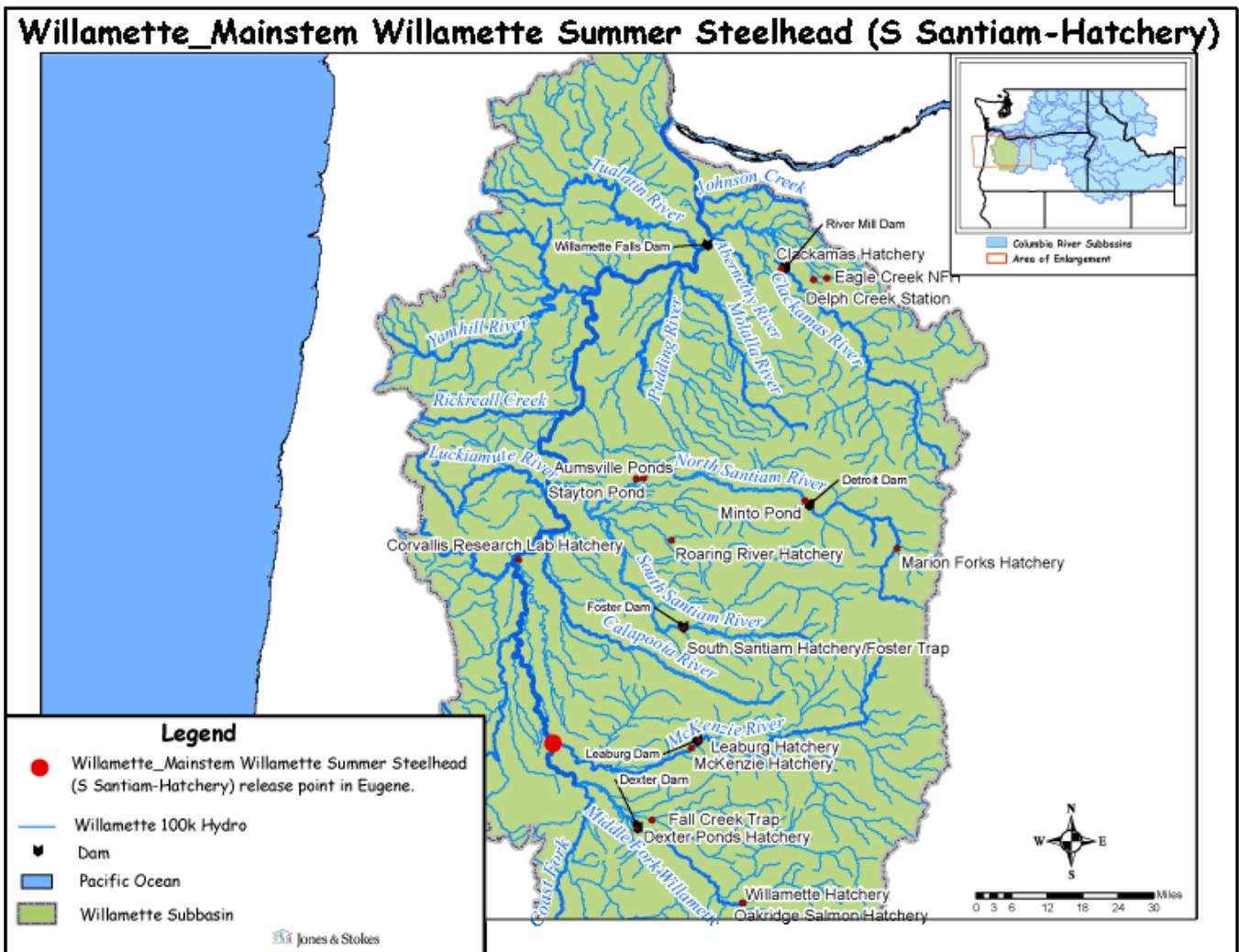
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Calapooia Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 2% | 0.00 | 556 | 3.5 | 17 | - |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 621 | 4.2 | 19 | - |
| HSRG Solution | None None | - | 0% | 0% | 2% | 0.00 | 568 | 3.6 | 17 | - |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 2% | 0.00 | 655 | 4.1 | 20 | - |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Willamette – Mainstem Willamette Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Mainstem Willamette Steelhead

This population consists of summer run steelhead outplanted from the Roaring River Hatchery. There is no information indicating that a natural run of steelhead exists for this area. There is general agreement that steelhead did not ascend the Willamette River beyond the Calapooia River. Theories on the factors affecting the distribution of steelhead vary from the occurrence of *Ceratomyxa shasta* in the lower portion of the river to passage problems in the historically highly braided river reaches above the Calapooia River. There are native *O. mykiss* populations in the upper portion of the Willamette Basin; however, these appear to be the resident form (Kostow 1995). Both summer and winter steelhead currently found in the Upper Willamette and tributaries are the descendants of hatchery introductions. These populations may pose a risk to native populations downstream associated with the out-of-ESU origin of most introductions.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: The Mainstem Willamette winter steelhead are not part of any ESU.
- Population Description: None
- Recovery Goal for Abundance: NA
- Productivity Improvement Expectation: NA
- Habitat Productivity and Capacity (e.g., from EDT): NA

2.2 Current Hatchery Programs Affecting this Population

Summer steelhead are released into the mainstem Willamette at Eugene as part of the Willamette River segregated harvest summer steelhead program. Broodstock are collected at the Foster Dam trap on the South Santiam River. Incubation occurs at the South Santiam Hatchery. Fish are reared at South Santiam, Roaring River, Leaburg and Dexter fish hatcheries. Yearling summer steelhead are released in April into the North Santiam (161,500), South Santiam (144,000), Willamette River at Eugene (42,000), Middle Fork Willamette (115,000) and McKenzie (108,000) rivers (HGMP 2004).

Since steelhead are not native to the upper Willamette River, no analysis of the effects of hatchery straying was done.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions

not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Since steelhead are not native to the upper Willamette River, no analysis of the effects of hatchery straying was done.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The upper Willamette River mainstem historically had no natural steelhead. The current program of 42,000 segregated summer steelhead smolts provides recreational fishing opportunities.

Recommendations

We have no specific recommendations for this program.

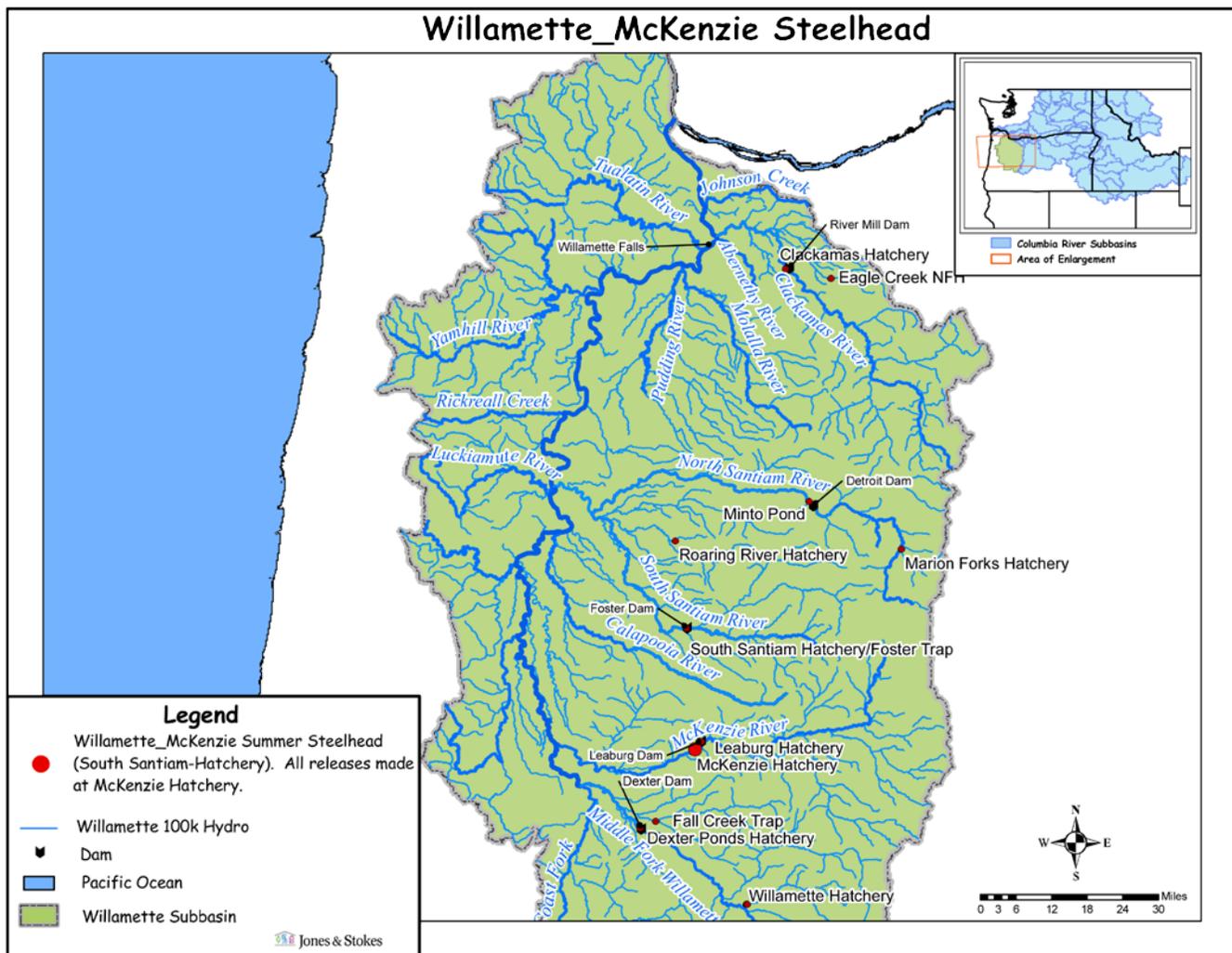
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Upper Willamette Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 51.2 | 0% | | | | | | 215 | 0 |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 51.2 | 0% | | | | | | 215 | 0 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 51.2 | 0% | | | | | | 215 | 0 |

Hatchery Scientific Review Group Review and Recommendations

Willamette – McKenzie Steelhead Population and Related Hatchery Programs

January 31, 2009



1 McKenzie Steelhead

This population consists of a few naturally-produced winter steelhead resulting from historic hatchery outplants and summer run steelhead outplanted from the South Santiam Hatchery. Steelhead are not native to the McKenzie River and there is general agreement that steelhead did not ascend the Willamette River beyond the Calapooia River. There are numerous theories on the factors affecting the distribution of steelhead. These vary from the occurrence of *Ceratomyxa shasta* in the lower portion of the river to passage problems in the historically highly braided river reaches above the Calapooia River. There are native *O. mykiss* populations in the upper portion of the Willamette Basin; however, these appear to be the resident form (Kostow 1995). Both summer and winter steelhead that currently are found in the McKenzie and Middle Fork Willamette rivers are the descendants of hatchery introductions. These populations may pose a risk to native populations downstream associated with the out-of-ESU origin of most introductions.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: The McKenzie Winter Steelhead are not part of any ESU.
- Population Description: None.
- Recovery Goal for Abundance: NA
- Productivity Improvement Expectation: NA
- Habitat Productivity and Capacity (e.g., from EDT): NA.

2.2 Current Hatchery Programs Affecting this Population

Summer steelhead are released into the basin as part of the Willamette River segregated harvest summer steelhead program. Broodstock are collected at Foster Dam trap on the South Santiam River and incubated at the South Santiam Hatchery. Fish are reared at South Santiam, Roaring River, Leaburg and Dexter fish hatcheries. Yearling summer steelhead are released in April into the North Santiam (161,500), South Santiam (144,000), Willamette River at Eugene (42,000), Middle Fork Willamette (115,000) and McKenzie (108,000) rivers (HGMP 2004).

Since steelhead are not native to the McKenzie River, no analysis of the effects of hatchery straying was done.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less

than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Since steelhead are not native to the McKenzie River, no analysis of the effect of removing hatchery influence from this watershed was done.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Steelhead are not native to the McKenzie River. Leaburg Hatchery releases about 188,000 segregated summer steelhead smolts annually. The current program provides recreational fishing opportunities. Aside from its potential ecological interactions, this program has no apparent impacts on natural populations of concern (spring Chinook) in the McKenzie River. This program has experienced IHN outbreaks in the past that may have a detrimental effect on resident trout populations.

Recommendations

We recommend that efforts be continued to minimize the prevalence of the IHN virus in this program.

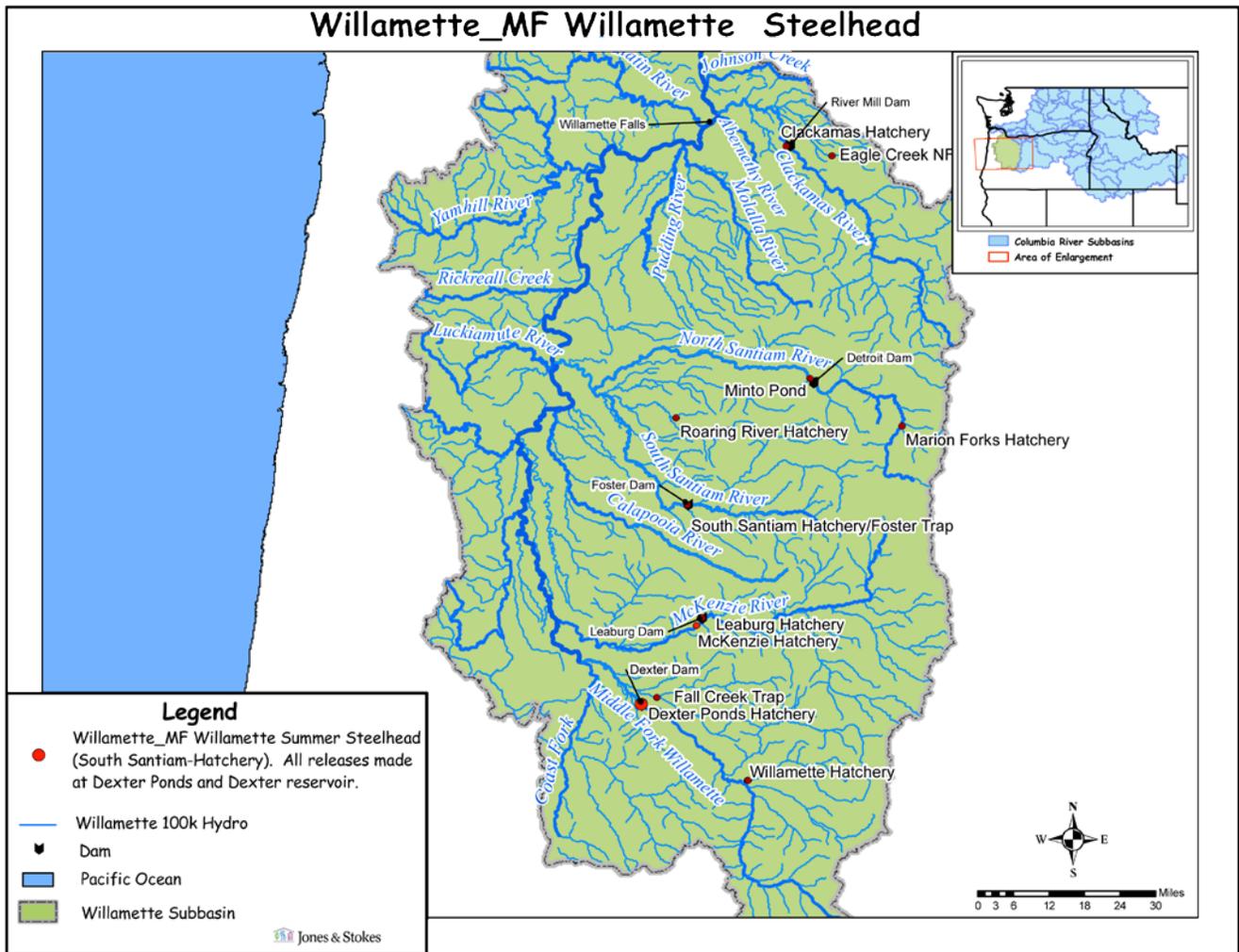
Table 1. Results of HSRG analysis of current condition and HSRG Solution for McKenzie Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 123.5 | 0% | | | | | | 1,488 | 0 |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 123.5 | 0% | | | | | | 1,488 | 0 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 123.5 | 0% | | | | | | 1,488 | 0 |

Hatchery Scientific Review Group Review and Recommendations

Willamette – Middle Fork Willamette Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Middle Fork Willamette Winter Steelhead

This population consists of naturally-produced winter steelhead resulting from historic hatchery outplants and summer run steelhead outplanted from the South Santiam hatchery. Steelhead are not native to the Middle Fork Willamette River. There is general agreement that steelhead did not ascend the Willamette River beyond the Calapooia River. Numerous theories seek to explain the factors affecting the distribution of steelhead. These vary from the occurrence of *Ceratomyxa shasta* in the lower portion of the river to passage problems in the historically highly braided river reaches above the Calapooia River. There are native *O. mykiss* populations in the upper portion of the Willamette Basin; however, these appear to be the resident form (Kostow 1995). Steelhead, both summer and winter, that currently are found in the McKenzie and Middle Fork Willamette rivers are the descendants of hatchery introductions. These populations may pose a risk to native populations downstream associated with the out-of-ESU origin of most introductions.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: The Middle Fork Willamette Winter Steelhead are not part of any ESU.
- Population Description: None
- Recovery Goal for Abundance: NA
- Productivity Improvement Expectation: NA
- Habitat Productivity and Capacity (e.g., from EDT): NA

2.2 Current Hatchery Programs Affecting this Population

Summer steelhead are released into the basin as part of the Willamette River segregated harvest summer steelhead program. Broodstock are collected at the Foster Dam trap on the South Santiam River and are incubated at the South Santiam Hatchery. Fish are reared at South Santiam, Roaring River, Leaburg and Dexter fish hatcheries. Yearling summer steelhead are released in April into the North Santiam (161,500), South Santiam (144,000), Willamette River at Eugene (42,000), Middle Fork Willamette (115,000) and McKenzie (108,000) rivers (HGMP 2004).

Since steelhead are not native to the Middle Fork Willamette River, no analysis of the effects of hatchery straying was done.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value

of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Since steelhead are not native to the Middle Fork Willamette River, no analysis of the effects of hatchery straying was done.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Middle Fork historically had no natural steelhead. The current program of 115,000 segregated summer steelhead smolts provides recreational fishing opportunities.

Recommendations

We have no specific recommendations for this program.

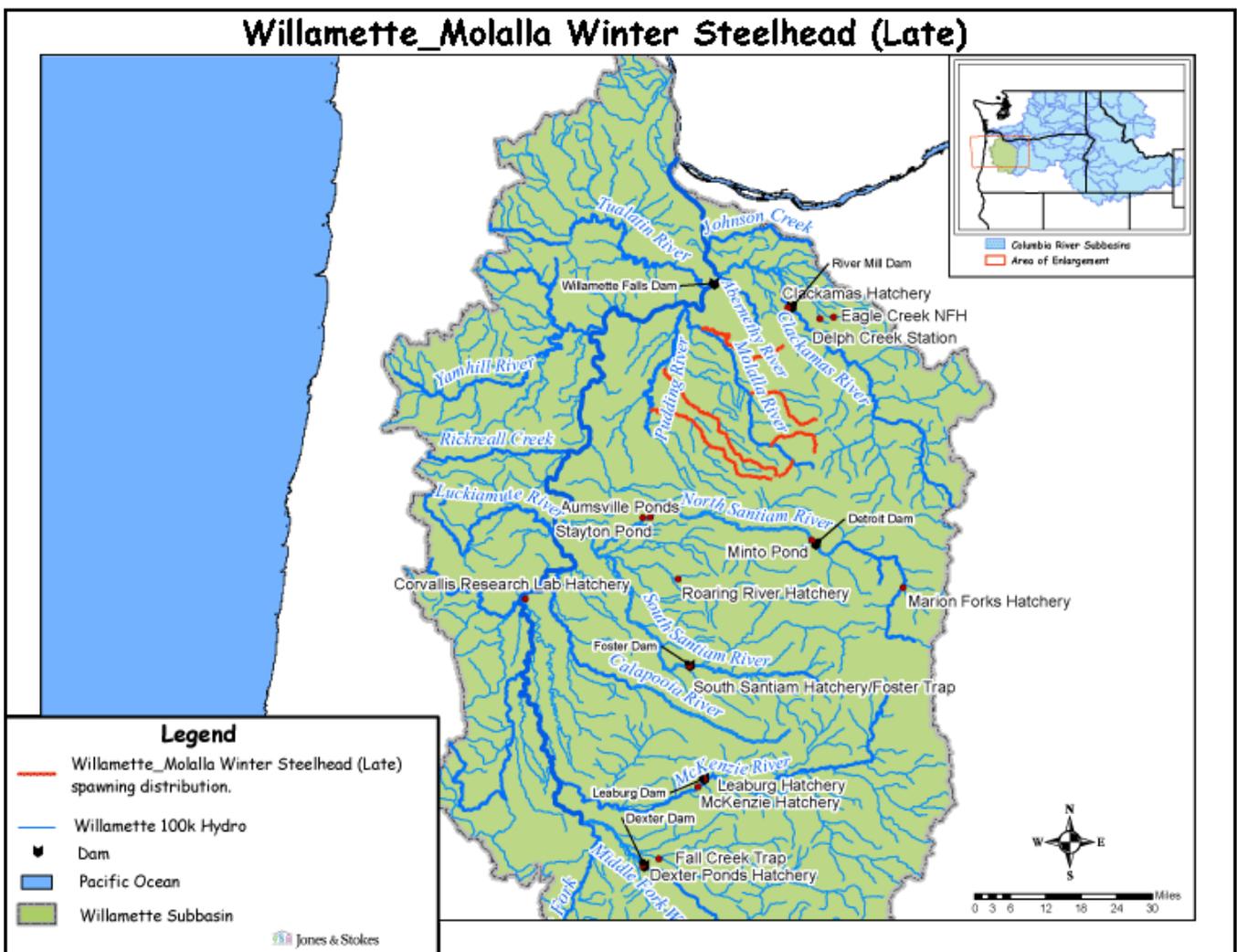
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Middle Fork Willamette Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 114.5 | 90% | | | | | | 480 | 473 |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 114.5 | 90% | | | | | | 480 | 473 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 114.5 | 90% | | | | | | 480 | 473 |

Hatchery Scientific Review Group Review and Recommendations

Willamette – Molalla Winter Steelhead (Late) Population and Related Hatchery Programs

January 31, 2009



1 Molalla Winter Steelhead (Late)

This population represents native late-run winter steelhead spawning in the Molalla River subbasin. The Molalla winter steelhead (late) population is one of four populations (Molalla, North Santiam, South Santiam, and Calapooia) comprising the Upper Willamette Steelhead ESU.

Land use and road building have limited anadromous fish access to many higher order tributaries in the Molalla and Pudding rivers. No large mainstem fish barriers are present on the Molalla River; however, dams and diversions on the Pudding River system may impede fish passage due to inadequate and/or outdated fish ladders. On a stream mile basis, this impairment is significant, although small high order streams that comprise most of the blocked area were not highly productive winter steelhead habitats. ODFW (2005) reported that virtually the entire historically significant steelhead habitat remains accessible. Habitat degradation due to land use has reduced water quality and the availability of suitable rearing habitat for steelhead in the Molalla River (McElhany et al. 2007 review draft).

Recent escapement estimates for Molalla River steelhead are in the low thousands of fish (Goodson 2005). In general, several hundred fish returned annually to the Molalla River, except in the mid-1990s when escapement dipped below 100. There is considerable uncertainty concerning the accuracy of the following abundance estimates because they are based on spawning surveys conducted for a small portion of the steelhead habitat within the basin. The Molalla late winter steelhead population is relatively large, with a natural-origin spawner long-term (1980-2005) geometric mean of 1,233 fish and a recent (1990-2005) geometric mean of 937 fish (McElhany et al. 2007 review draft). In recent years, the geometric mean of recruits per spawner was 1.378, with a hatchery fraction of zero. These values are in the viable to very low risk minimum abundance threshold (MAT) category.

Pre-harvest viability curve analyses suggest that the population is probably viable if harvest levels remain at current rates (average post-1990 mortality rate = 0.10) (McElhany et al. 2007 review draft). The escapement viability curves suggest that the harvest pattern observed over the course of the time series (which included a period of time when the mortality rate was 0.23) is not likely sustainable by the population.

Native late-run winter steelhead in the Willamette Basin are distinguished from non-native early winter steelhead by the date of passage at Willamette Falls—February 15. Fish ascending the falls after February 15 are considered native late-run steelhead (McElhany 2003b). Recent analyses of returning steelhead adults indicate that Upper Willamette River late-winter steelhead mature at four different ages: Age 4 (48%), Age 5 (41%), Age 6 (10%) and Age 7 (6%) (McElhany et al. 2007 review draft). Winter steelhead egg incubation rates vary with water temperature, with eggs hatching anywhere between 18 and 101 days (U.S. Army Corps of Engineers 2002). Native upper Willamette winter steelhead fry emerge predominately in June (ODFS 1990-Subbasin Plan). Although there is some variability, most winter steelhead spend two years in the spawning watershed or downstream reaches before out-migrating (Wevers et al. 1992). Winter steelhead smolts migrate over Willamette Falls beginning in early April and extending through early June, with peak migration in mid-May (U.S. Army Corps of Engineers 2002). Mean lengths of naturally produced smolts sampled at Willamette Falls from 1976 to 1978 ranged from 170 millimeters to 220 millimeters. Larger smolts migrated significantly earlier than smaller smolts (Buchanan et al. 1979).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Molalla Winter Steelhead (late) are part of the Upper Willamette River Steelhead DPS, which was listed as Threatened under the ESA on March 25, 1999; the threatened status was reaffirmed January 5, 2006.
- **Population Description:** The Molalla Winter Steelhead (late) population has not been assigned a designation by the TRT. This population was given a Primary designation for the HSRG review.
- **Recovery Goal for Abundance:** Unknown
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (e.g., from EDT):** Productivity: 6.5, Capacity: 1,528

2.2 Current Hatchery Programs Affecting this Population

There are currently no steelhead hatchery programs in the Molalla River subbasin. The Molalla River has received hatchery plants of three distinct runs of steelhead: native late-run winter steelhead, introduced early-run winter steelhead (from the Lower Columbia River), and introduced Skamania Hatchery summer-run steelhead (Chilcote 1997). Releases of the early-run steelhead into the Molalla River were discontinued in 1997 (Chilcote 1997), although some natural production of early-run winter steelhead may still occur. Overall, hatchery contribution to escapement has been near 40%, although currently it is near 0%. Genetic analyses indicate a close genetic affinity between winter steelhead populations in the Santiam, Molalla (North Fork), and Calapooia rivers. Steelhead that are the progeny of summer-run and early winter-run steelhead are genetically distinct from presumptive native steelhead. Differences in spawn timing among these run-times may limit (but not eliminate) the potential for interbreeding.

Since Willamette Falls was laddered in the early 1900s, hatchery stocks of summer and early-run winter steelhead have been introduced into the upper Willamette River from other ESUs. In 1982, it was estimated that 15% of the late-run winter steelhead ascending Willamette Falls were of hatchery origin (Howell et al. 1985). All of the hatchery programs for steelhead were discontinued in the late 1990s, except for summer steelhead programs in the North Santiam, South Santiam, McKenzie, and Middle Fork Willamette rivers, where winter steelhead are not native. Currently the only strays into the Molalla River are likely from summer steelhead programs in the McKenzie and Santiam Rivers.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 6 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of

effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

No hatchery programs for steelhead currently operate in the Molalla River and it is estimated that steelhead from out-of-basin programs make less than a 1% contribution to the natural spawning populations in the basin. Given these assumptions, there would be no change to productivity, natural-origin spawning, or harvest for the Molalla River winter steelhead population under our No Hatchery scenario.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

This population appears to meet the standards for a Primary population designation. There is no hatchery program in this subbasin.

Recommendations

Periodically monitor the contribution of hatchery strays to the natural population.

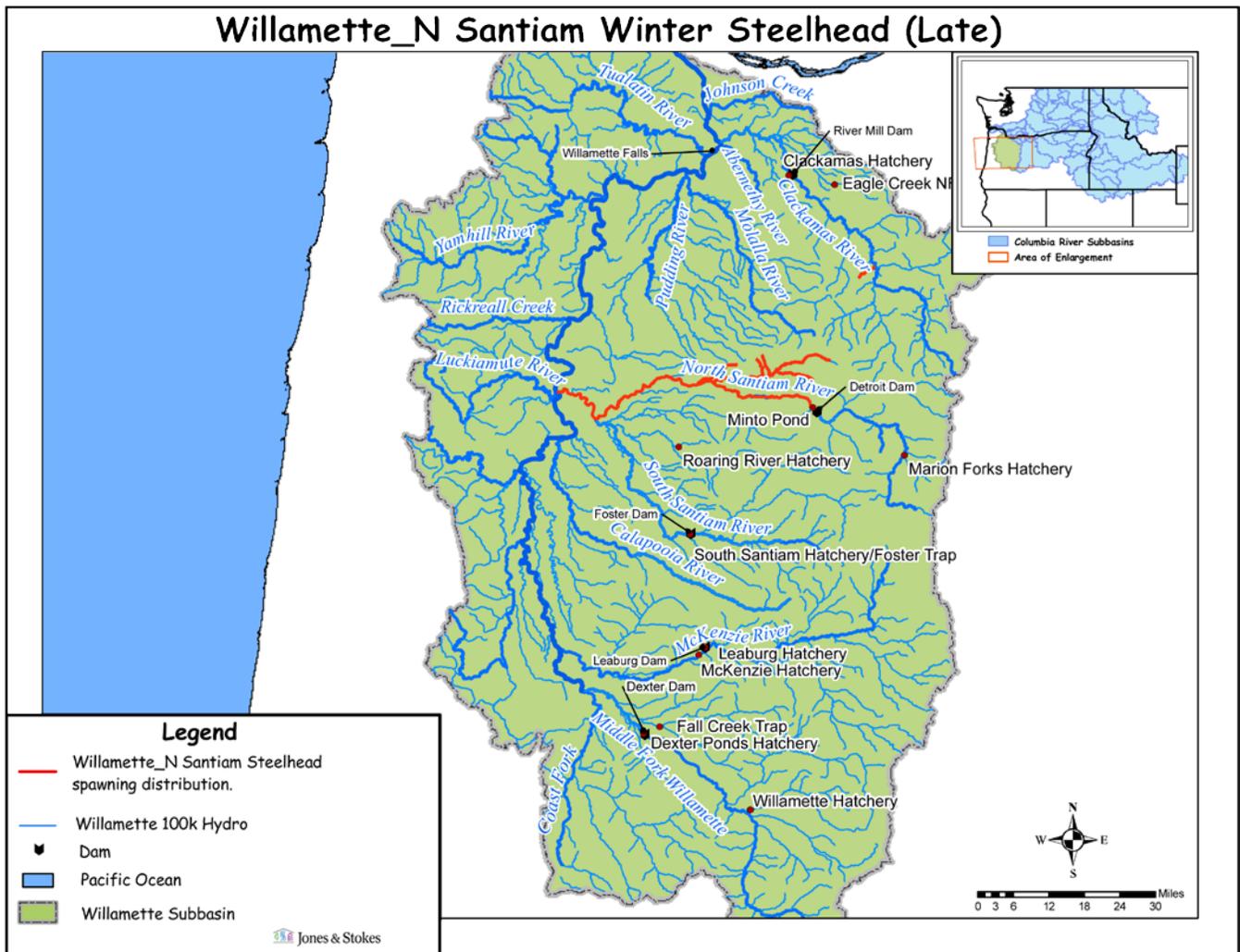
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Molalla Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 1,712 | 5.1 | 53 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,714 | 5.2 | 53 | - |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 1,712 | 5.1 | 53 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 1,925 | 5.7 | 59 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Willamette – North Santiam Winter Steelhead (Late) Population and Related Hatchery Programs

January 31, 2009



1 North Santiam Winter Steelhead (Late)

The North Santiam winter steelhead (late) population is one of four populations (Molalla, North Santiam, South Santiam, and Calapooia) comprising the Upper Willamette Steelhead ESU. This population, as well as the South Santiam, was designated as a core population and a genetic legacy within the ESU by the TRT (Subbasin Plan). Although steelhead in this ESU are depressed from historical levels, all of the historical populations remain extant with moderate numbers of wild steelhead produced each year. These populations have been adversely affected by the alteration and loss of spawning and rearing habitat associated with hydropower development. Hatchery-reared winter steelhead are no longer released into any of the upper Willamette River steelhead populations. However, introduced hatchery summer steelhead still occur in the North and South Santiam basins.

The North Santiam late winter steelhead population is relatively large, with a long-term (1980-2005) geometric mean natural-origin spawners of 2,722 and a recent (1990-2005) geometric mean of 2,109 (McElhany et al. 2007 review draft). In the recent period, the geometric mean recruits per spawner was 1.2, with an average pHOS 0.11. These values are in the very low risk minimum abundance threshold category. The pre-harvest viability curve analyses suggest that the population is probably viable if harvest levels remain low. The escapement viability curves suggest that the harvest pattern observed over the course of the time series is likely to be sustainable.

Surveys done in 1940 estimated that the run of steelhead was at least 2,000 fish (Parkhurst et al. 1950) (McElhany et al. 2007 review draft). Parkhurst also reports that larger runs of steelhead existed in the Breitenbush, Little North Santiam, and Marion Fork rivers. Native steelhead were artificially propagated at the North Santiam Hatchery beginning in 1930, when a record 2,860,500 eggs (686 females x 4170 eggs/female) were taken (Wallis 1963). Production was somewhat intermittent during the 1940s. Attempts to capture all returning steelhead were unsuccessful due to the frequency and magnitude of spring floods (Wallis 1963). With the construction of Detroit Dam, the contribution of naturally-produced fish to escapement declined considerably. Access to large portions of historically productive steelhead habitat has been blocked by Detroit Reservoir (McElhany et al. 2007 review draft). ODFW estimates that 46% of the historically suitable habitat for steelhead is now inaccessible (ODFW 2005). The blocked areas historically included some of the most productive habitats in this system, although productive habitat remains in the Little North Santiam River. Habitat has also declined in the remaining accessible areas (McElhany et al. 2007 review draft).

There appears to be little change from historical spawn timing. Currently, winter steelhead return to the Minto trap on the North Santiam from April through May (Wevers et al. 1992). Adult winter steelhead arrive at Foster Dam from February through June, with the peak of the run usually in mid-April, and there is no evidence that there has been a shift from the historical run timing (ODFW 1990). Redd counts for winter steelhead in the Upper Willamette subbasin are conducted in May.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: North Santiam Winter Steelhead (late) are part of the Upper Willamette River Steelhead DPS, which was listed as Threatened under the ESA on March 25, 1999; the threatened status was reaffirmed January 5, 2006.
- Population Description: The North Santiam Winter Steelhead (late) population has been designated as a core population and a genetic legacy by TRT. This population was given a Primary designation for the HSRG review.
- Recovery Goal for Abundance: Unknown
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity (e.g., from EDT): Productivity: 6.96; Capacity: 3,783.

2.2 Current Hatchery Programs Affecting this Population

The release of hatchery propagated late-run winter steelhead was discontinued in 1998 (NMFS 1999) (McElhany et al. 2007 review draft). Prior to that time, there were releases of locally derived late-winter steelhead beginning in the 1920s.

Summer steelhead are released into the basin as part of the Willamette River segregated harvest summer steelhead program. Broodstock are collected at Foster Dam trap on the South Santiam River. Incubation occurs at South Santiam Hatchery. Fish are reared at South Santiam, Roaring River, Leaburg and Dexter fish hatcheries. Yearling summer steelhead are released in April into the North Santiam (161,500), South Santiam (144,000), Willamette River at Eugene (42,000), Middle Fork Willamette (115,000) and McKenzie (108,000) rivers (HGMP 2004).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 2,169 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 3.1 to 6.1. Average abundance of natural-origin spawners (NOS) would increase from approximately 1,586 fish to approximately 3,134 fish. Harvest contribution of the natural and hatchery populations would go from approximately 3,660 fish to approximately 393 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

It is estimated that 46% of the historic suitable habitat in the North Santiam watershed is no longer accessible to steelhead due to dam construction.

This is one of two potential strongholds for natural production of winter steelhead. Given the information available, it is unknown whether this population meets the standards for a contributing or a primary population due to potentially high proportions of hatchery fish on the spawning grounds.

Annually, 161,500 summer steelhead smolts from a segregated program are released into the North Santiam River at Minto Pond. The current fishery appears inadequate to remove available hatchery steelhead. Although no evaluation has been conducted of the program to recycle adults in this watershed, indications from other watersheds suggest that reducing or discontinuing recycling reduces the number of hatchery fish on the spawning grounds.

Recommendations

Given the available information, better tracking of returning summer steelhead is recommended. Unless hatchery fish can be accounted for and the ability to manage composition on the spawning ground (below 5% effective spawners) can be demonstrated, the program should be reduced. (Assuming the current estimated ability to collect adults, the program size would need to be reduced to approximately 40,000 smolts.)

Managers should consider discontinuing recycling adults through the fishery and/or liberalize fishing regulations to achieve a higher harvest rate on hatchery fish. If 90% of the unharvested hatchery fish could be removed, then a program of the current size could be maintained consistent with the guidelines for the designation of a Primary population.

Given the broodstock management (recycling), the program would need to be reduced to about 40,000 smolts to meet the guidelines for designation as a Primary population.

The ecological effect on natural steelhead is a concern (Kostow and Zhou 2006). Both of the foregoing options represent a reduced genetic and ecological risk. After making a program decision, periodically assess the ecological risks under this program. In any case, manage acclimation and release to reduce residualism and recapture unharvested adults to the extent possible.

Improve or replace the acclimation facilities at Minto Pond. We suggest improving adult collection and handling/holding abilities for winter steelhead to facilitate reintroduction in the upper basin.

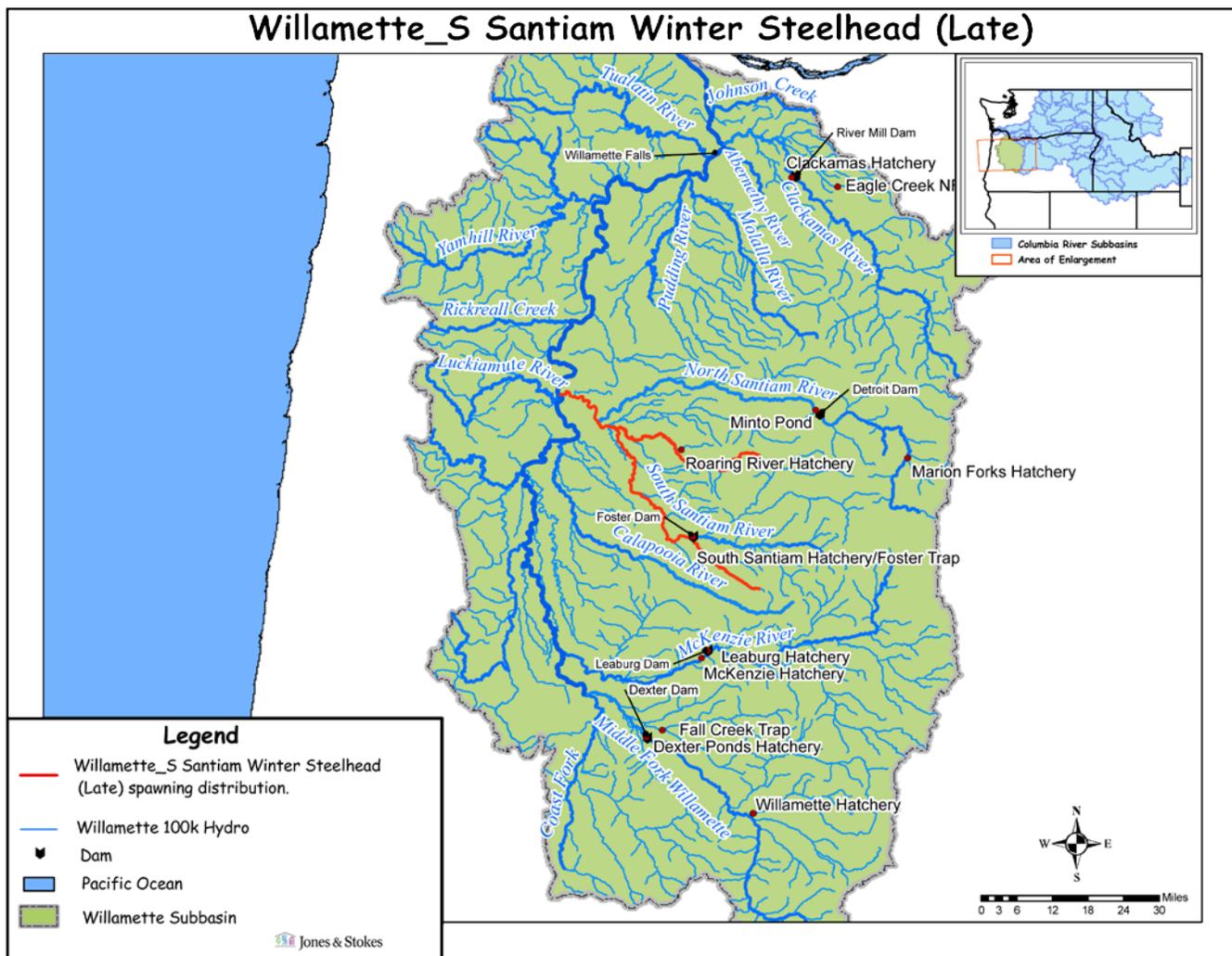
Table 1. Results of HSRG analysis of current condition and HSRG Solution for North Santiam Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 19% | 0.00 | 1,586 | 3.1 | 199 | 0 |
| | Seg Harv | 161.1 | 40% | | | | | | 3,461 | 1,513 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 3,134 | 6.1 | 393 | - |
| HSRG Solution | None None | - | 0% | 0% | 2% | 0.00 | 2,680 | 5.1 | 336 | 0 |
| | Seg Harv | 161.1 | 90% | | | | | | 3,461 | 3,403 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 2% | 0.00 | 3,086 | 5.8 | 387 | 0 |
| | Seg Harv | 161.1 | 90% | | | | | | 3,461 | 3,403 |

Hatchery Scientific Review Group Review and Recommendations

Willamette - South Santiam Winter Steelhead (Late) Population and Related Hatchery Programs

January 31, 2009



1 South Santiam Winter Steelhead (Late)

The South Santiam winter steelhead (late) population is one of four populations (Molalla, North Santiam, South Santiam, and Calapooia) comprising the Upper Willamette Steelhead ESU. This population, as well as the North Santiam, was designated as a core population and a genetic legacy within the ESU by the TRT (Subbasin Plan). While steelhead in this ESU are depressed from historical levels, all of the historical populations remain extant with moderate numbers of wild steelhead produced each year. However these populations have been adversely affected by the alteration and loss of spawning and rearing habitat associated with hydropower development. Hatchery-reared winter steelhead are no longer released into any of the upper Willamette steelhead populations. However, introduced hatchery summer steelhead still occur in the North and South Santiam basins and also migrate via the mainstem Willamette River to the McKenzie River basin.

ODFW considers the late-run winter steelhead in the South Santiam River to be one population, although Foster Dam may influence the distribution of spawners in the river (Chilcote 1997). Natural spawners above and below Foster Dam are monitored as distinct units and appear to be demographically independent. Currently, the combined escapement to the South Santiam is a few thousand fish (2,296 from 2000-2004), but during the mid-1990s the average was near 1,000 fish (Goodson 2005) (McElhany et al. 2007 review draft).

Spawner abundance estimates, with the exception of the upper South Santiam, are based entirely on spawning surveys conducted for a small portion of the steelhead habitat. The results from these surveys are then expanded for the entire watershed to obtain an estimate for population abundance. As a consequence there is considerable uncertainty concerning the accuracy of the following abundance estimates. The South Santiam late winter steelhead population is relatively large, with a long-term (1968-2005) geometric mean natural-origin spawner of 2,727 and a recent (1990-2005) geometric mean of 2,302 (McElhany et al. 2007 review draft). During the recent period, the geometric mean recruits per spawner was 1.5, with an average hatchery fraction of zero. The pre-harvest viability curve analyses suggest that the population is probably viable if harvest levels remain low. The escapement viability curves suggest that the harvest pattern observed over the course of the time series is likely sustainable (McElhany et al. 2007 review draft).

Access to the upper South Santiam has been blocked by Foster and Green Peter dams, although significant steelhead habitat remains in other portions of this system (McElhany et al. 2007 review draft). In the case of Foster Dam, a trap and haul program is currently moving fish upstream of this blockage. There is no passage of steelhead above Green Peter Dam and so the historical production area upstream of this dam is no longer accessible. ODFW (2005) estimated that 17% of the historically suitable habitat for steelhead is now inaccessible (McElhany et al. 2007 review draft). Access has also been impaired in the upper reaches of many small low-elevation tributaries, although these areas likely did not historically support high densities of steelhead. Habitat degradation due to land use and flow regulation has reduced water quality and the availability of suitable rearing habitat for steelhead in the South Santiam River (McElhany et al. 2007 review draft).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** South Santiam Winter Steelhead (late) are part of the Upper Willamette River Steelhead DPS, which was listed as Threatened under the ESA on March 25, 1999; the threatened status was reaffirmed January 5, 2006.
- **Population Description:** The South Santiam Winter Steelhead (late) population has been designated as a core population and a genetic legacy by TRT. This population was given a Contributing designation for the HSRG review.
- **Recovery Goal for Abundance:** Unknown
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (e.g., from EDT):** Productivity: 7.0; Capacity: 3800.

2.2 Current Hatchery Programs Affecting this Population

Hatchery releases of winter steelhead have not occurred in this basin since 1989, and the proportion of hatchery-reared fish that currently spawn naturally in the South Santiam River is believed to be less than 5% (Chilcote 1997), although prior to 1989 it was over 40% (Goodson 2005). Hatchery operations began in 1926, and in 1940 a record 3,335,000 eggs were taken from 800 females (Wallis 1961). The run size at this time was probably much larger because it was not possible to install the weir in the river until much of the run had already moved far upstream (Wallis 1961) (McElhany et al. 2007 review draft).

Summer steelhead are currently released into the basin as part of the Willamette River segregated harvest summer steelhead program. Broodstock are collected at Foster Dam trap on the South Santiam River. Incubation occurs at South Santiam Hatchery. Fish are reared at South Santiam, Roaring River, Leaburg and Dexter fish hatcheries. Yearling summer steelhead are released in April into the North Santiam (161,500), South Santiam (144,000), Willamette River at Eugene (42,000), Middle Fork Willamette (115,000) and McKenzie (108,000) rivers (HGMP 2004).

In 2003, 11,493 summer steelhead returned to the South Santiam Hatchery. Although differences in spawn timing may limit the potential for genetic introgression, it is unclear how competition between summer and winter steelhead juveniles or adults may influence the expression of life history traits (McElhany et al. 2007 review draft). Only winter steelhead that arrive at Foster Dam are transported above the dam. This effectively creates two zones in the South Santiam River, below Foster Dam where summer and winter steelhead co-mingle and above Foster Dam where only naturally-produced (unmarked) fish are allowed (McElhany et al. 2007 review draft).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 450 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 5.5 to 6.7. Average abundance of natural-origin spawners (NOS) would increase from approximately 3,100 fish to approximately 3,500 fish. Harvest contribution of the natural and hatchery populations would go from approximately 5,800 fish to approximately 140 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Operation of this segregated summer steelhead program is consistent with a designation of this population as Primary. This is a stronghold of winter steelhead production in the upper Willamette River Distinct Population Segment. Along with the North Santiam population, it is one of two important populations above Willamette Falls. About 144,000 summer steelhead smolts from a segregated program are released at the South Santiam Hatchery.

Recommendations

Managers should consider discontinuing recycling adults through the fishery and/or liberalize fishing regulations to achieve the highest possible removal rate of hatchery fish from the spawning grounds.

The ecological effect on natural steelhead may be a concern (Kostow and Zhou 2006). Periodically assess the ecological risks under this program. In any case, manage acclimation and release to reduce residualism and recapture unharvested adults to the extent possible.

We suggest improving adult collection and handling/holding abilities for winter steelhead to facilitate reintroduction in the upper basin.

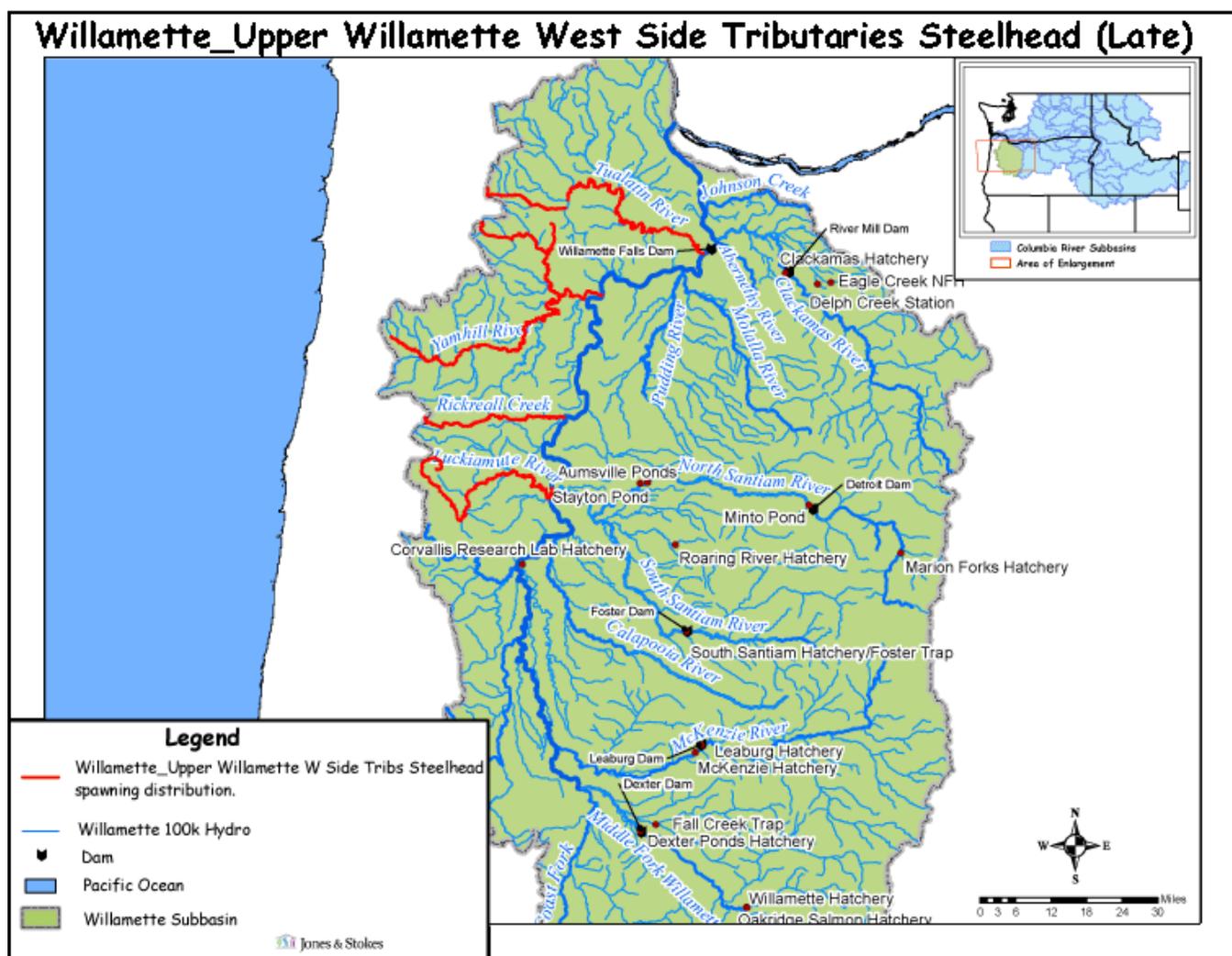
Table 1. Results of HSRG analysis of current condition and HSRG Solution for South Santiam Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 2% | 0.00 | 3,097 | 5.5 | 128 | 0 |
| | Seg Harv | 144.1 | 90% | | | | | | 5,643 | 2,396 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 3,456 | 6.7 | 142 | - |
| | Seg Harv | 144.1 | 90% | | | | | | 5,643 | 2,396 |
| HSRG Solution | None None | - | 0% | 0% | 2% | 0.00 | 3,046 | 5.7 | 126 | 0 |
| | Seg Harv | 144.1 | 90% | | | | | | 5,643 | 2,396 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 2% | 0.00 | 3,480 | 6.5 | 143 | 0 |
| | Seg Harv | 144.1 | 90% | | | | | | 5,643 | 2,396 |

Hatchery Scientific Review Group Review and Recommendations

Willamette – Upper Willamette River West Side Tributaries Winter Steelhead (Late) Population and Related Hatchery Programs

January 31, 2009



1 Upper Willamette Westside Tributaries Winter Steelhead (Late)

This population includes late winter steelhead naturally spawning in westside tributaries of the Willamette River draining the Coast Range, including the Tualatin, Yamhill, Rickreall and Luckiamute rivers. The westside tributaries are intermittently used by steelhead, which may be important for ESU recovery, but is not considered to have historically been an independent population (Myers et al. 2006; McElhany et al. 2007 review draft). There is considerable debate as to whether the existing fish are native or derived from introduced stocks (Myers et al. 2003). Others have suggested that winter steelhead are only native to the eastside tributaries draining the Cascade Range (McElhany et al. 2007 review draft).

Naturally spawning winter steelhead are currently found in several westside tributaries of the Willamette River (Tualatin [Gales Creek], the Luckiamute, Rickreall Creek, and the Yamhill River). Surveys in 1940 reported anecdotal information of steelhead spawning in Gales Creek, a tributary to the Tualatin River (Parkhurst et al. 1950). Numerous introductions of early-run winter steelhead (Big Creek Hatchery stock) and late-run (North Santiam stock) winter steelhead have been made into the Tualatin River; this makes it difficult to determine whether the existing fish represent native or introduced lineages (Subbasin Plan).

With the exception of Gales Creek in the Tualatin subbasin, Parkhurst et al. (1950) did not report the presence of any salmon or steelhead in the westside tributaries. ODFW observations suggest that late-run winter steelhead may have recently colonized the Yamhill River (NMFS 1999).

Recent genetic analysis of presumptive steelhead from the westside tributaries indicates that fish from the Yamhill River and Rickreall Creek were most similar to hatchery populations from the lower Columbia River. Fish sampled from the Luckiamute River had no clear affinity with any other steelhead populations and may be representative of an isolated resident *O. mykiss* population (Subbasin Plan).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Willamette Westside Tributaries Winter Steelhead (late) are part of the Upper Willamette River Steelhead DPS, which was listed as Threatened under the ESA on March 25, 1999; the threatened status was reaffirmed January 5, 2006.
- **Population Description:** The Willamette Westside Tributaries Winter Steelhead (late) population has not been assigned a designation by the TRT. This population was given a Contributing designation for the HSRG review.
- **Recovery Goal for Abundance:** Unknown
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (e.g., from EDT):** Productivity: 2.0; Capacity: 250 assigned for this review.

2.2 Current Hatchery Programs Affecting this Population

There are no steelhead hatchery programs in the Upper Willamette Westside Tributaries, including the Tualatin, Yamhill, Rickreall and Luckiamute rivers.

Since Willamette Falls was laddered in the early 1900s, hatchery stocks of summer and early-run winter steelhead have been introduced into the Upper Willamette River from other ESUs. In 1982, it was estimated that 15% of the late-run winter steelhead ascending Willamette Falls were of hatchery origin (Howell et al. 1985). All of the hatchery programs for steelhead were discontinued in the late 1990s, except for summer steelhead programs in the North Santiam, South Santiam, McKenzie, and Middle Fork Willamette rivers. Winter steelhead are not native to the McKenzie River in the middle fork of the Willamette River. Currently the only strays into the Upper Willamette Westside Tributaries are likely from summer steelhead programs in the McKenzie and Santiam rivers.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 10 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.2 to 1.8. Average abundance of natural-origin spawners (NOS) would

increase from approximately 40 fish to approximately 100 fish. Harvest contribution of the natural and hatchery populations would go from approximately 5 fish to approximately 13 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager’s goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

There is no hatchery program in this subbasin and no information about the natural production of steelhead.

Recommendations

The HSRG has no recommendations for this population.

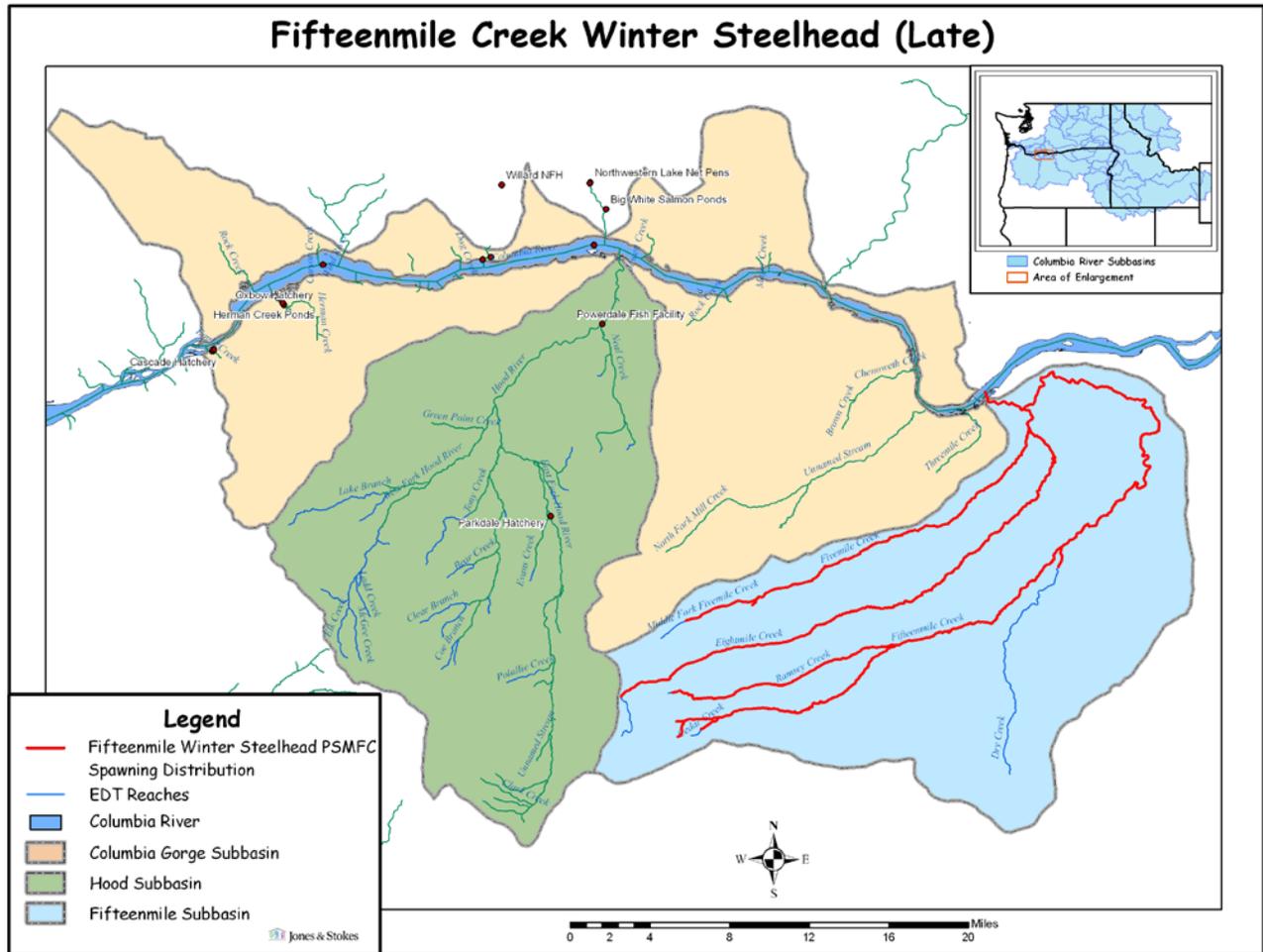
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Westside Willamette Tributary Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 5% | 0.00 | 42 | 1.2 | 5 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 104 | 1.8 | 13 | - |
| HSRG Solution | None None | - | 0% | 0% | 3% | 0.00 | 54 | 1.3 | 7 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 2% | 0.00 | 101 | 1.7 | 13 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Fifteenmile Winter Steelhead (Late) Population and Related Hatchery Programs

January 31, 2009



1 Fifteenmile Winter Steelhead (Late)

This population includes Fifteenmile Creek and its tributaries, Eightmile and Ramsey creeks. Spawning areas in these creeks are characterized as continuous and there is little environmental variation in the subbasin. The population is moderately segregated from others (22 km from the Klickitat and 37 km from the nearest spawning in the Deschutes River), and occupies somewhat different habitat. These characteristics, coupled with basin size, genetic differentiation and apparent capacity led the Interior TRT to designate this as a separate population. Fifteenmile Creek is the easternmost distribution of winter steelhead in the Columbia Basin. Within the population, genetic samples from Eightmile Creek (Currens 1997) were highly divergent from samples from Fifteenmile Creek, the Deschutes River, and the Lower Columbia ESU. These Eightmile Creek samples appear to represent a resident redband rainbow population with little or no interbreeding with anadromous fish (Currens pers. comm. and USDOJ TRT 2003).

The native Fifteenmile Creek winter run is one of only two populations of inland winter steelhead in the United States- the other is in the Klickitat River. Within the Fifteenmile Creek subbasin, winter steelhead have been found in Fifteenmile Creek, Ramsey Creek, Eightmile, Fivemile, Dry Creek, Mill Creek and its forks, Mosier Creek, and Rock Creek, as well as near the mouths of Threemile and Chenoweth creeks and many intermittent streams. It is not known if steelhead in the other watersheds are genetically identical to those in Fifteenmile Creek.

Winter steelhead enter Fifteenmile Creek in February and March. Spawning is generally completed by the end of May when flows are sufficient to provide good fish passage. The Forest Service and ODFW conduct spawning surveys in Fifteenmile and Eightmile creeks upstream of US 197 and in Ramsey Creek. Within the surveyed areas, the following reaches appear to be particularly productive for steelhead: Eightmile Creek from US 197 to Walston Grade, the lower five miles of Ramsey Creek, and Fifteenmile Creek from US 197 to one mile above Dufur City Intake. These areas are assumed to be the primary spawning reaches in the watershed.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Fifteenmile Winter Steelhead are part of the Middle Columbia River Steelhead DPS which was listed as Threatened under the ESA in 2006.
- Population Designation: Unknown
- Current Viability Rating: Unknown
- Recovery Goal for Abundance: Unknown
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity (from EDT): Productivity: 2.2, Capacity: 1,577

2.2 Current Hatchery Programs Affecting this Population

No steelhead hatchery programs are currently operating in this subbasin.

Few out-of-DPS hatchery steelhead have been observed spawning with this population (Draft Mid-Columbia Summer Steelhead Recovery Plan ODFW 2008)

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 4 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

No hatchery programs for steelhead currently operate in Fifteen Mile Creek, and it is estimated that steelhead from out-of-basin programs make less than a 1% contribution to the natural spawning populations in the subbasin. Given these assumptions, there would be no change to productivity, natural-origin spawning, or harvest for the Fifteen Mile Creek winter steelhead population under our No Hatchery scenario.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

No hatchery programs for steelhead operate in Fifteen Mile Creek, and out-of-basin strays are estimated to make up less than 1% of the natural spawning population. Habitat limitations are the primary concern for this population.

Recommendations

The HSRG recommends that this population continue to be managed for natural production. Focus actions on habitat protection and improvement that will improve productivity and capacity of the system. Monitor the contribution of hatchery strays from nearby hatchery programs.

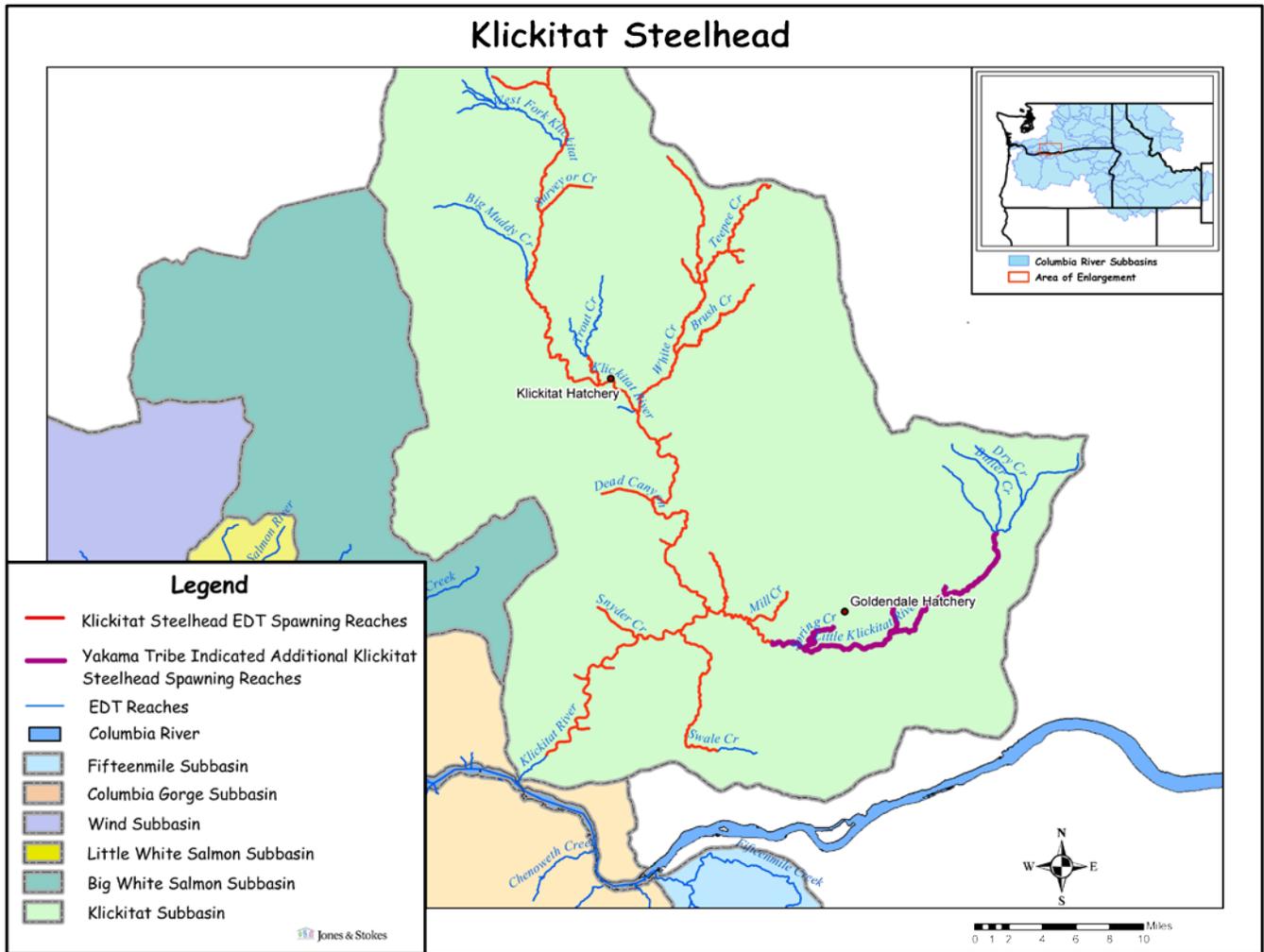
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Fifteen Mile Creek Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 725 | 1.9 | 104 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 729 | 1.9 | 104 | - |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 728 | 1.9 | 104 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 884 | 2.1 | 126 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Klickitat Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Klickitat Steelhead

The Interior Columbia Technical Recovery Team combined natural summer and winter Klickitat steelhead populations into one population because spawning areas overlap and samples from the sport fishery do not show strong segregation. Genetic information (Phelps et al. 2000) indicates some degree of genetic differentiation between tributaries of the Klickitat River, with Upper Klickitat, White Creek, and Trout Creek appearing to be most different from the Skamania Hatchery stock.

Washington Department Fish & Game identifies both a summer-run population (SaSI #6833) and winter-run population (SaSI #6840) in the Klickitat River subbasin. The native Klickitat winter run is one of only two populations of inland winter steelhead in the United States- the other is in Fifteenmile Creek.

Native Klickitat steelhead are part of the Mid-Columbia Steelhead Distinct Population Segment (DPS). The Mid-Columbia Steelhead DPS, as described by National Marine Fisheries Service (NMFS), occupies the Columbia River Basin from Mosier Creek, Oregon, upstream into the Yakima River subbasin in Washington. In proposing to list this ESU, NMFS cited low returns to the Yakima River, poor abundance estimates for Klickitat River and Fifteenmile Creek winter steelhead, and an overall decline for naturally producing stocks within the ESU (NMFS 1999).

Spawning occurs from early March through early June and is concentrated in the Klickitat and Little Klickitat rivers with some spawning also taking place in Swale, White and Trout creeks and their tributaries.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Native Klickitat steelhead are part of the Mid-Columbia Steelhead DPS which was listed as Threatened under the ESA in 1999. This status was reaffirmed in 2005.
- Population Designation: Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette arrives at a designation of Primary.
- Current Viability Rating: Unknown
- Recovery Goal for Abundance: Unknown
- Productivity Improvement Expectation: Unknown.
- Habitat Productivity and Capacity (from EDT): Productivity: 4.20; Capacity: 1,621; with passage at Castile Falls Productivity: 4.5, Capacity: 2,597

2.2 Current Hatchery Programs Affecting this Population

Summer steelhead from the Skamania River are released into the Klickitat River at RKM 16.1, 29.0, 40.3, and 45.1 (HGMP 2004). Smolt releases average around 100,000 annually (22-year average) and are released at ~6.7 fish per pound (14-year average) in late April to early May. Brood collection, spawning, and rearing all take place at the Skamania Hatchery on the Washougal River. The program operates as a Segregated Harvest program collecting only hatchery origin brood from the Washougal River.

- For future out-plants to the Klickitat River, the Yakima/Klickitat Fisheries Project (YKFP) Transition Plan (Oshie and Ferguson 1998) calls for phasing out Skamania Hatchery stock and shifting to supplementation of naturally spawning Klickitat stock. Implementation of this new effort would be conducted at the Klickitat Hatchery.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 415 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.6 to 4.2. Average abundance of natural-origin spawners (NOS) would increase from 1,241 to 2,053. Harvest contribution of the natural and hatchery populations would go from 2,918 to 996.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases, more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The current segregated program (100,000 direct plant summer steelhead from Skamania Hatchery) is consistent with management principles for a Primary summer steelhead population. There is little data available on winter steelhead in the Klickitat subbasin.

If considering an integrated program, there are a number of implications including residualism, infrastructure costs, and challenges collecting spawning broodstock over the entire run.

Recommendations

Either an integrated or segregated summer steelhead program can be operated consistent the HSRG guidelines for a Primary population (PNI >0.67 for an integrated program or a pHOS less than 5% for a segregated program). However, each has a different set of potential risks and benefits.

With a segregated program, considerations include collection of broodstock from Klickitat Hatchery (local broodstock of Skamania origin) and would require adult collection facilities to minimize straying.

For an integrated program, considerations would include sufficient infrastructure for broodstock collection and rearing. Program goals would likely be met with a 25% pNOB objective. A concern with integrated steelhead programs is the potentially high rate of residualism.

The HSRG supports ongoing winter steelhead data collection by managers and improved data collection facilities such as the fish trap facility proposed at Lyle Falls.

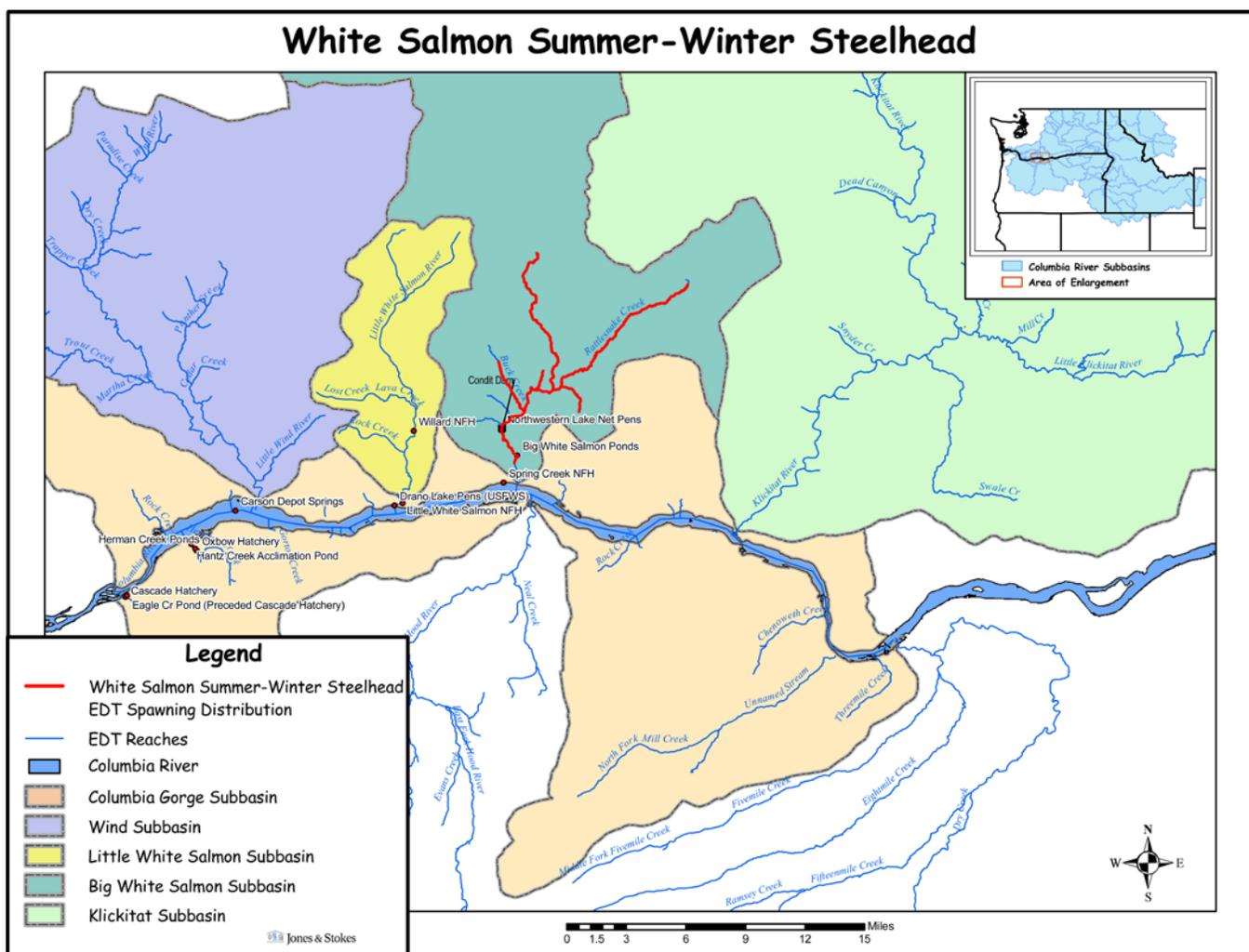
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Klickitat Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 6% | 0.00 | 1,241 | 2.6 | 602 | 0 |
| | Seg Harv | 100.5 | 0% | | | | | | 2,316 | 0 |
| No Hatchery | None None | | | 0% | | 1.00 | 2,053 | 4.2 | 996 | - |
| HSRG Solution | Int Harv | 120.4 | 80% | 0% | 4% | 0.87 | 2,001 | 4.0 | 2,972 | 308 |
| | Seg None | - | 0% | | | | | | - | - |
| HSRG Solution w/ Improved Habitat | Int Harv | 120.4 | 80% | 0% | 3% | 0.88 | 2,276 | 4.5 | 3,105 | 308 |
| | Seg None | - | 0% | | | | | | - | - |

Hatchery Scientific Review Group Review and Recommendations

White Salmon Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 White Salmon Summer Steelhead

Steelhead trout are native to the White Salmon River (WDF et al. 1993) and their historical distribution extended from the mouth up to RM 16 in the mainstem, and Buck, Spring, Indian, and Rattlesnake creeks. The current distribution is limited to the area below Condit Dam (RM 3.4).

Current steelhead abundance at equilibrium in the White Salmon subbasin is expected to be 20 steelhead (in the absence of harvest). EDT modeling indicates wild steelhead abundance in the absence of harvest has declined from 1,137 spawners to less than 20 spawners.

Two races of steelhead exist, winter and summer. Winter steelhead enter rivers from November to May and are usually near final stages of maturity upon entry. Summer steelhead return as immature fish between April and October, although some summer steelhead hold over in the Columbia River throughout the year and enter tributaries as they approach spawning. It is likely that both races historically were present in the White Salmon subbasin.

Wild steelhead from both races spawn from February through June, with peak spawning in April. Hatchery stocks used in the White Salmon subbasin typically spawn from December through February, with peak activity in January. Steelhead typically spend two or three years as juveniles in freshwater before outmigrating to the ocean. Outmigration takes place during the spring and typically peaks in early May.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- **ESA Status:** The White Salmon steelhead are considered to be part of the Middle Columbia GDU, which includes 101 populations of Washington steelhead between the White Salmon and Walla Walla rivers (Leider et al. 1995). The NMFS has included this population in the Middle Columbia River Evolutionary Significant Unit (ESU), which was listed as Threatened under the ESA in 1999. The threatened status was reaffirmed in 2006.
- **Population Description:** The Lower Columbia Salmon Recovery and Subbasin Plan indicates that a natural summer steelhead population is not present in the White Salmon River (LCSR&SP 2004). The status of steelhead in the White Salmon River is listed as depressed due to the lack of access to historical spawning areas (WDF et al. 1993).
- **Recovery Goal for Abundance:** Unknown
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (e.g., from EDT):** Productivity: 3.9, Capacity: 25 (with no passage at Condit Dam); Productivity: 2.9, Capacity: 406 (with passage at Condit Dam).

2.2 Current Hatchery Programs Affecting this Population

Two hatchery programs affect this population: a segregated summer steelhead plant of about 20,000 smolts and a segregated winter steelhead plant of about 20,000 smolts; both coming from

Skamania Hatchery as direct outplants. No steelhead hatchery programs are currently operating in this subbasin.

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 566

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.7 to 3.4. Average abundance of natural-origin spawners (NOS) would increase from 3 to 17. Harvest contribution of the natural and hatchery populations would go from 302 to 3.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

After removal of Condit Dam, it may be possible for the steelhead population to be managed consistent with the standards for a Contributing population. Two hatchery programs affect this population: a segregated summer steelhead plant of about 20,000 smolts and a segregated winter steelhead plant of about 20,000 smolts; both coming from Skamania Hatchery as direct outplants. We also note that most of the recreational harvest of summer steelhead in the Big White Salmon River appears to be provided by hatchery fish from other out-of-basin hatchery programs (dip-ins) as the harvest has averaged 3,900 fish per year recently. The contribution from the current summer steelhead releases into this river appears to be small relative to the dip-ins. In addition, releases of winter steelhead into the Big White Salmon appear to provide very little harvest benefit (less than 100 fish).

A genetic legacy for the steelhead population may still be contained in the existing resident rainbow trout population upstream of Condit Dam (Phelps 1990). This should be taken into consideration in reestablishing a natural population after Condit Dam is removed (scheduled for 2008-2009).

Recommendations

Given that conservation is a goal after removal of Condit Dam and the limited harvest benefits from the in-basin releases, managers might consider discontinuing the segregated programs for both summer and winter steelhead to promote reestablishment of naturally-spawning populations of steelhead from resident populations.

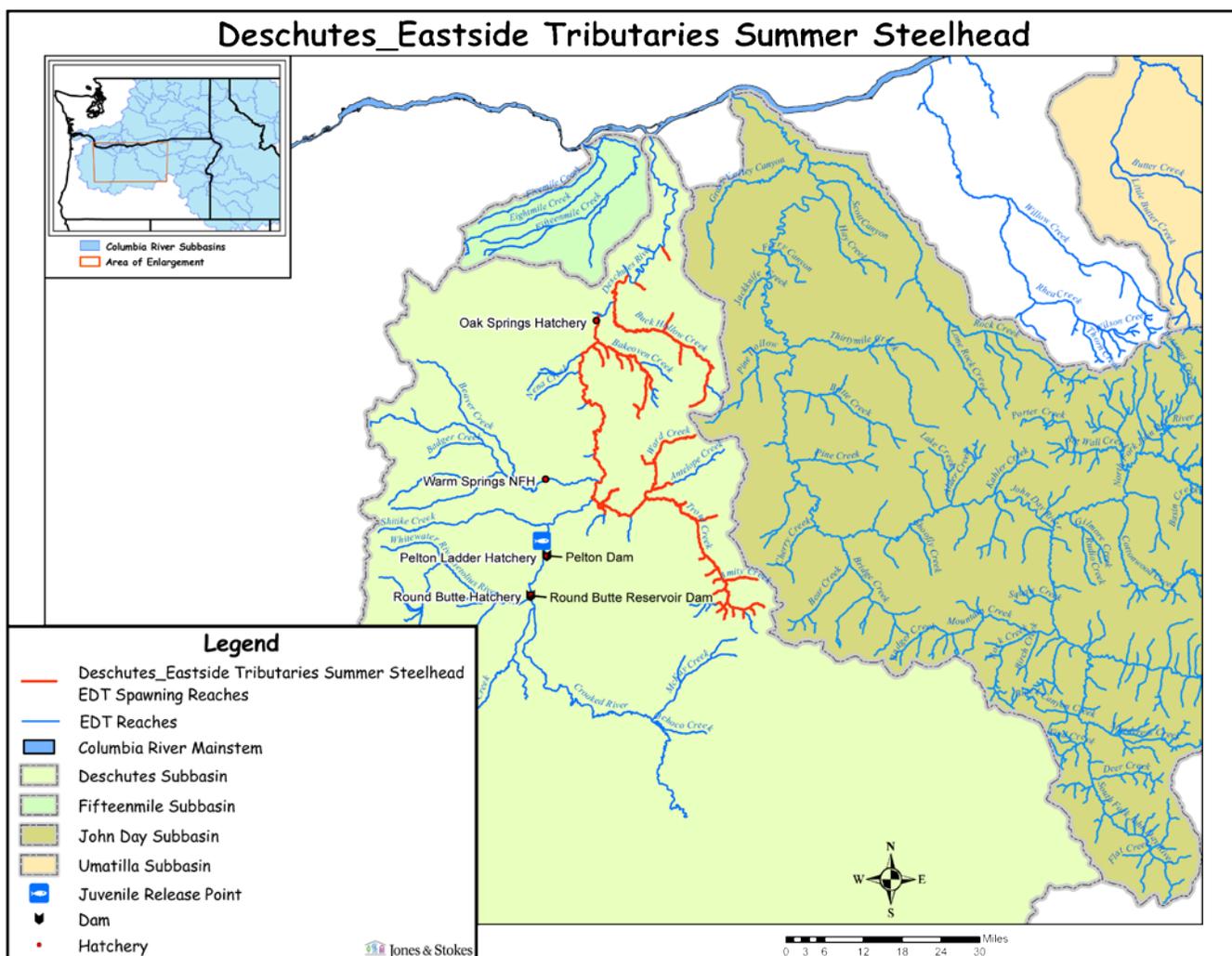
Table 1. Results of HSRG analysis of current condition and HSRG Solution for White Salmon River Summer Winter Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|--------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Summer /Winter None None | - | 0% | 0% | 97% | 0.00 | 3 | 1.7 | 0 | 0 |
| | Winter Seg Harv | 19.8 | 0% | | | | | | 141 | 1 |
| | Summer Seg Harv | 20.1 | 0% | | | | | | 161 | 0 |
| No Hatchery | Summer /Winter None None | - | 0% | 0% | 0% | 1.00 | 17 | 3.4 | 3 | - |
| HSRG Solution | Summer /Winter None None | - | 0% | 0% | 72% | 0.00 | 3 | 1.7 | 0 | 0 |
| | Winter Seg Harv | - | 0% | | | | | | - | - |
| | Summer Seg Harv | - | 0% | | | | | | - | - |
| HSRG Solution w/ Improved Habitat | Summer /Winter None None | - | 0% | 0% | 68% | 0.00 | 3 | 1.9 | 1 | 0 |
| | Winter Seg Harv | - | 0% | | | | | | - | - |
| | Summer Seg Harv | - | 0% | | | | | | - | - |

Hatchery Scientific Review Group Review and Recommendations

Deschutes-Eastside Tributaries Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Deschutes-Eastside Tributaries Summer Steelhead

The Deschutes River enters the Columbia at RM 205 above Bonneville and The Dalles dams, draining 10,500 square miles (the second largest subbasin in the state). It originates in the Cascade Mountains, flowing north along the eastern margin of the hills where the Cascades to the west meet the low-lying flats to the east.

Steelhead in the Deschutes River and its tributaries have been segregated by the Interior TRT into two distinct groupings; those that spawn in the westside tributaries and those that spawn in the eastside tributaries. The Deschutes River drains relatively dry, low-gradient streams flowing out of arid desert to the east and wetter, higher gradient streams flowing out of the Cascade Mountains to the west. Distinct habitat types and flow regimes have led to temporally segregated spawn timing between the westside and eastside tributaries, with westside spawning peaking between January and April and eastside spawning peaking between April and May (Olsen et al. 1992).

In recent years, wild adult steelhead returns to the Deschutes subbasin have exceeded the NOAA Fisheries interim spawner escapement objective of 6,300 wild steelhead. The run, however, remains below the ODFW goal for the Deschutes, which calls for a spawning escapement of 6,575 wild steelhead upstream from Sherars Falls to sustain maximum natural production potential during years of good juvenile and adult survival conditions. During years of outstanding fresh water and ocean rearing conditions and high smolt-to-adult survival, spawning escapement could be considerably larger (ODFW 1997). Steelhead production in the subbasin may expand in the near future if passage is restored past the Pelton Round Butte Project. Originally, Round Butte included fish passage facilities, but with the construction of Round Butte Dam in 1964, fish passage was abandoned and focus was shifted to hatchery production.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Naturally spawning summer steelhead in the Deschutes system are included in the Middle Columbia River Steelhead DPS which was listed as Threatened under the ESA in 1999. Threatened status was reaffirmed in 2006.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette arrives at a designation of Primary.
- **Current Viability Rating:** Unknown
- **Recovery Goal for Abundance:** Unknown
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (from EDT):** Productivity: 4.11, Capacity: 6,055

2.2 Current Hatchery Programs Affecting this Population

The goal of the Round Butte Hatchery/Pelton Trap complex is to rear and release 162,000 summer steelhead smolts (Stock No. 066) at ~4.2 fpp in April for an expected return of ~1,800

adults. Stock 066 is not included as part of the Middle Columbia River Steelhead DPS and so has no listing status under the ESA.

This program operates as a segregated harvest program, collecting only hatchery marked adults returning to the Pelton Trap at RM 100 on the Deschutes River. Adult volunteers are collected from the trap in three groupings: October 1 to December 9, December 10 to January 31, and February 1 to March 1, with one-third of the needed broodstock being collected during each period. Round Butte Hatchery origin adults volunteering to the trap are collected for broodstock, distributed to members of the Confederated Tribes of the Warm Springs, or disposed of by burying.

Broodstock are trucked to Round Butte Hatchery approximately 5 miles upstream of the Pelton Trap where they are held on Deschutes River water seeping from Lake Billy Chinook until mature and ready to spawn. Mating is 1:1 with 2 families being combined after fertilization. Families are marked on heath trays in the event culling due to INHV is necessary. Fish at Round Butte Hatchery are reared on seepage from Lake Billy Chinook that has been determined to be pathogen free.

Summer steelhead are released in April at ~ 4.2 fpp. Because the Round Butte Hatchery is above Lake Simtustus and the Pelton Dam, smolts are trucked below the dam and released at the Pelton Trap.

Coded-wire tag recoveries at the Warm Springs Hatchery indicate that a high percentage of steelhead straying into the Deschutes system originated from hatcheries or release locations in the Grande Ronde, Imnaha, Wallowa and other rivers in the Snake River Basin.

Out-of-DPS hatchery strays are approximately 30% of the naturally spawning of this population. This has been recognized as a risk to the population (Mid-Columbia Steelhead Recovery Plan – ODFW Draft 2007).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 1,810 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines

for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.9 to 3.8. Average abundance of natural-origin spawners (NOS) would increase from approximately 2,951 fish to approximately 4,623 fish. Harvest contribution of the natural and hatchery populations would go from approximately 612 fish to approximately 349 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The management goal is to sustain natural production and harvest.

The Deschutes Round Butte segregated hatchery program releases 162,000 smolts and is operated consistent with a Primary designation of both the east side and west side natural populations. Large numbers of out-of-DPS strays are a major concern for this population.

Recommendations

We have no specific recommendations to improve the Round Butte program. Efforts should be made to remove out-of-DPS hatchery strays from the population through harvest, weirs or other means (e.g., live trapping at Sherars Falls or other locations).

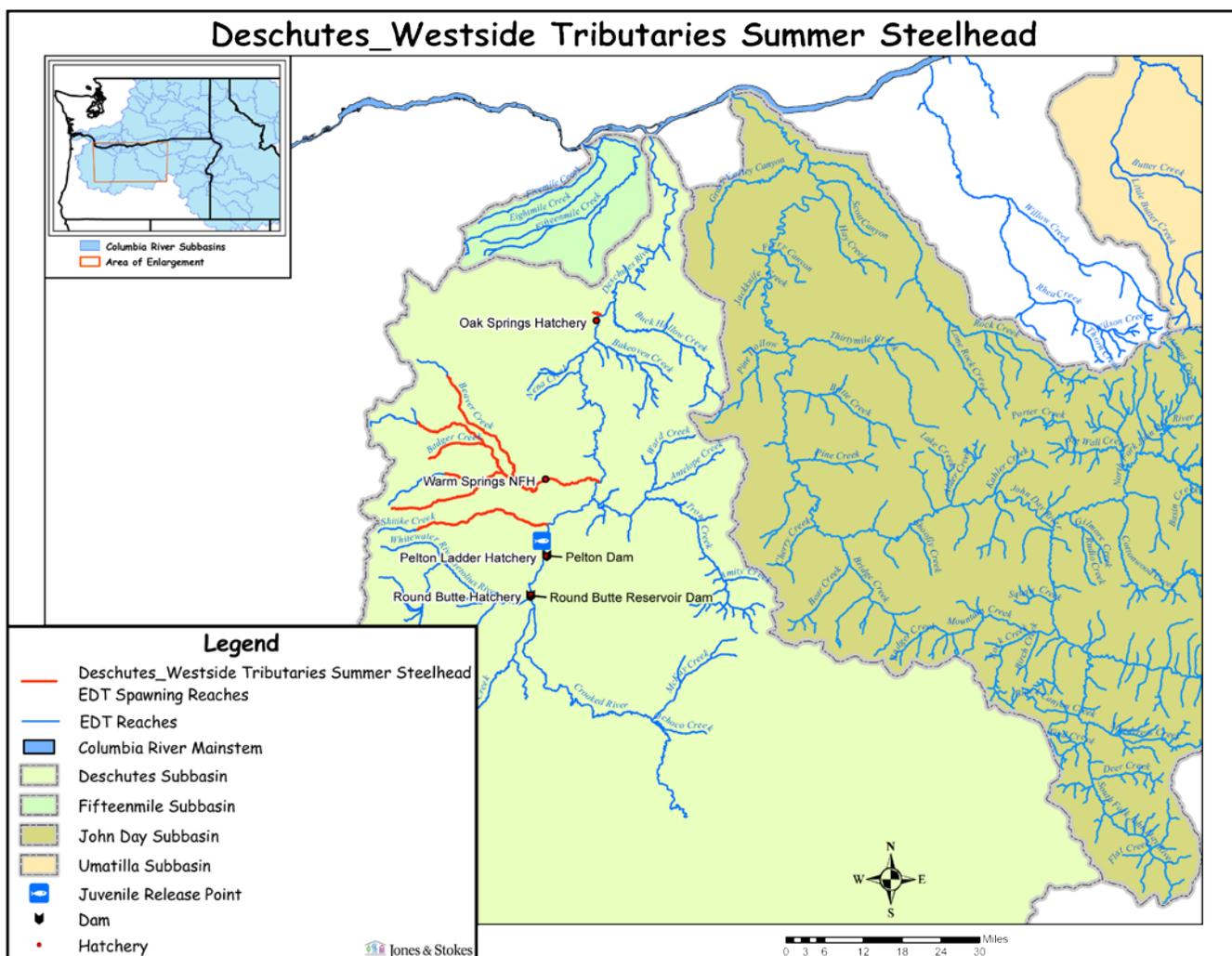
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Eastside Deschutes Tributary Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|----------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 20% | 0.00 | 2,951 | 1.9 | 223 | 0 |
| | Round Butte Seg Harv | 162.1 | 95% | | | | | | 389 | 2,145 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 4,623 | 3.8 | 349 | - |
| HSRG Solution | None None | - | 90% | 85% | 2% | 0.00 | 4,092 | 3.2 | 309 | 0 |
| | Round Butte Seg Harv | 162.1 | 95% | | | | | | 389 | 2,145 |
| HSRG Solution w/ Improved Habitat | None None | - | 90% | 85% | 2% | 0.00 | 4,767 | 3.7 | 360 | 0 |
| | Round Butte Seg Harv | 162.1 | 95% | | | | | | 389 | 2,145 |

Hatchery Scientific Review Group Review and Recommendations

Deschutes-Westside Tributaries Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Deschutes-Westside Tributaries Summer Steelhead

The Deschutes River enters the Columbia at RM 205 above Bonneville and The Dalles dams and drains 10,500 square miles (the second largest subbasin in the state). It originates in the Cascade Mountains, flowing north along the eastern margin of the hills where the Cascades meet the low-lying flats to the east.

The Deschutes River drains relatively dry, low-gradient streams flowing out of arid desert to its east bank and wetter, higher gradient streams flowing out of the Cascade Mountains to the west bank. Steelhead in the Deschutes River and its tributaries have been structured by the Interior TRT into two distinct groupings; those that spawn in the westside tributaries and those that spawn in the eastside tributaries. Distinct habitat types and flow regimes have led to temporally segregated spawn timing between the westside and eastside tributaries, with westside spawning peaking between January and April and eastside spawning peaking between April and May (Olsen et al. 1992).

In recent years, wild adult steelhead returns to the Deschutes subbasin have exceeded the NOAA Fisheries interim spawner escapement objective of 6,300 wild steelhead for the subbasin. The run, however, remains below the ODFW goal for the Deschutes, which calls for a spawning escapement of 6,575 wild steelhead upstream from Sherars Falls to sustain maximum natural production potential during years of good juvenile and adult survival conditions. During years of outstanding fresh water and ocean rearing conditions and high smolt-to-adult survival, spawning escapement could be considerably larger (ODFW 1997). Steelhead production in the subbasin may expand in the near future if passage is restored past the Pelton Round Butte Project. Originally, Round Butte included fish passage facilities but with the construction of Round Butte Dam in 1964, fish passage was abandoned and focus was shifted to hatchery production.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Naturally spawning summer steelhead in the Deschutes system are included in the Middle Columbia River Steelhead DPS which was listed as Threatened under the ESA in 1999. Threatened status was reaffirmed in 2006.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette arrives at a designation of Primary.
- **Current Viability Rating:** Unknown
- **Recovery Goal for Abundance:** Unknown
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (from EDT):** Productivity: 1.99, Capacity: 1,766

2.2 Current Hatchery Programs Affecting this Population

The goal of the Round Butte Hatchery/Pelton Trap complex is to rear and release 162,000 summer steelhead smolt (Stock No. 066) at ~4.2 fpp in April for an expected return of ~1,800

adults. Stock 066 is not included as part of the Middle Columbia River Steelhead DPS and so has no listing status under the ESA.

This program operates as a segregated harvest program collecting only marked hatchery adults returning to the Pelton Trap at RM 100 on the Deschutes River. Adult volunteers are collected from the trap in three groupings: October 1 to December 9, December 10 to January 31, and February 1 to March 1, with one-third of the needed broodstock being collected during each period. Round Butte Hatchery-origin adults volunteering to the trap are collected for broodstock, distributed to members of the Confederated Tribes of the Warm Springs, or disposed of by burying.

Broodstock are trucked to the Round Butte Hatchery approximately 5 miles upstream of the Pelton Trap, where they are held in Deschutes River water seeping from Lake Billy Chinook until mature and ready to spawn. Mating is 1:1 with 2 families being combined after fertilization. Families are marked on heath trays in the event culling due to INHV is necessary. Fish at Round Butte Hatchery are reared on seepage from Lake Billy Chinook that has been determined to be pathogen free.

Summer steelhead are released in April at ~ 4.2 fpp. Because the Round Butte Hatchery is above Lake Simtustus and Pelton Dam, smolts are trucked below the dam and released at the Pelton Trap.

Coded-wire tag recoveries at the Warm Springs Hatchery indicate that a high percentage of steelhead straying into the Deschutes system originated from hatcheries or release locations in the Grande Ronde, Imnaha, Wallowa and other rivers in the Snake River Basin.

Out-of-DPS hatchery strays are approximately 16% of the naturally spawning of this population. This has been recognized as a risk to the population (Mid-Columbia Steelhead Recovery Plan-ODFW 2007 draft).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 149 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines

for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.9 to 1.8. Average abundance of natural-origin spawners (NOS) would increase from approximately 339 fish to approximately 818 fish. Harvest contribution of the natural and hatchery populations would go from approximately 26 fish to approximately 62 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The management goal is to sustain natural production and harvest.

The Deschutes Round Butte segregated hatchery program releases 162,000 smolts and is operated consistent with a Primary designation of both the east side and west side natural populations. Large numbers of out-of-DPS strays are a major concern for this population.

Recommendations

We have no specific recommendations to improve the Round Butte program, although efforts should be made to remove hatchery strays from the population through harvest, weirs or other means (e.g., live trapping at Sherars Falls, Warm Springs National Fish Hatchery, and other locations).

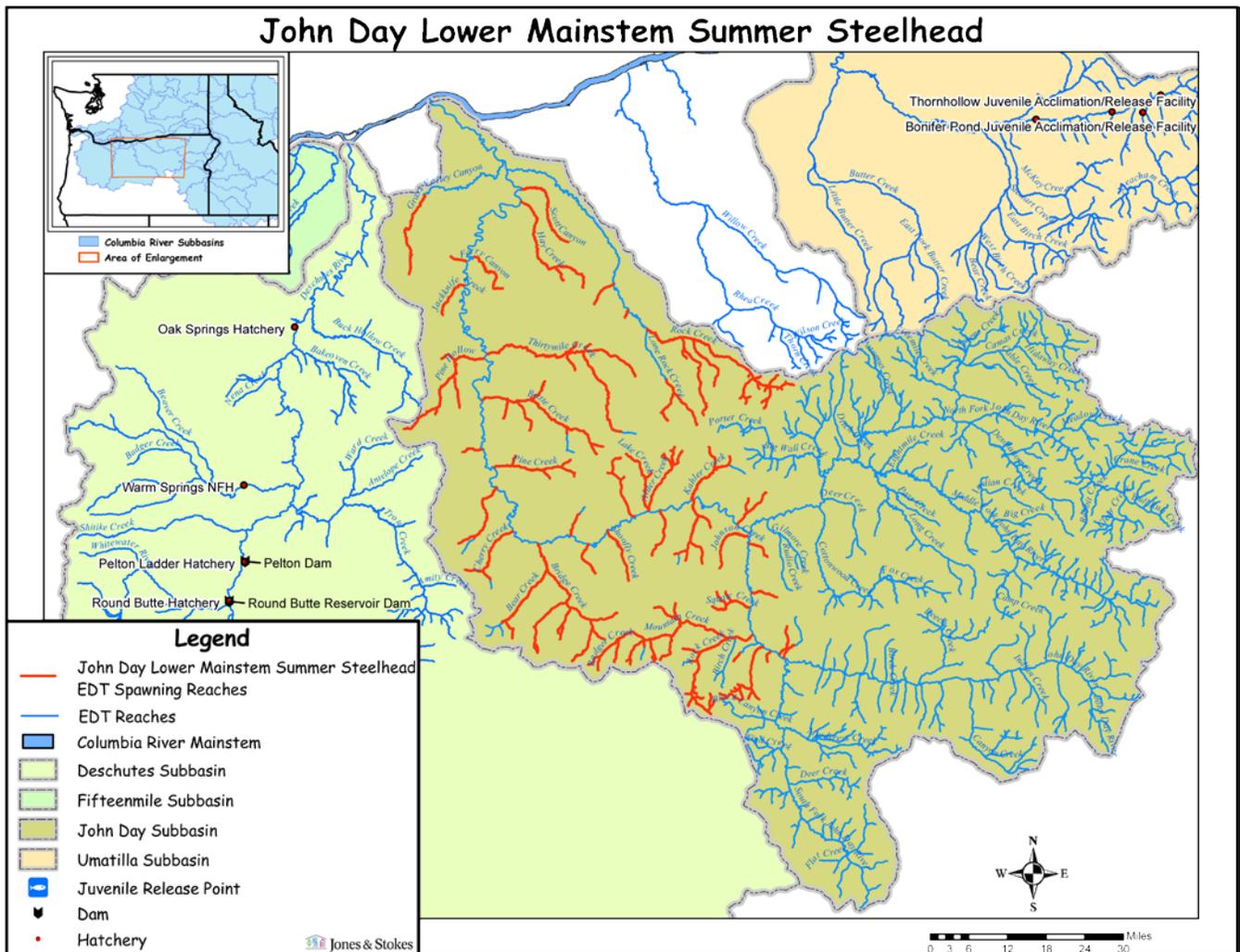
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Westside Deschutes Tributary Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 16% | 0.00 | 339 | 0.9 | 26 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 818 | 1.8 | 62 | - |
| HSRG Solution | None None | - | 0% | 25% | 11% | 0.00 | 302 | 1.0 | 23 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 25% | 8% | 0.00 | 426 | 1.1 | 32 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

John Day Lower Mainstem Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 John Day Lower Mainstem Summer Steelhead

The Interior Columbia Basin Technical Recovery Team (TRT) defined the John Day River as a major grouping based primarily on subbasin topography and distance from other spawning aggregates (NOAA Fisheries 2003). This subbasin is one of the few remaining summer steelhead streams in the interior Columbia Basin that have had little influence from introduced hatchery fish and that have more recently been classified as strong or healthy (Lee et al. 1997, Huntington et al. 1994). Within this major grouping, the TRT defined five populations on the basis of genetic information, demographic correlations, and habitat/ecoregion data. Spawning areas are widely distributed across tributary and mainstem habitats but are not well documented. Steelhead are widely distributed throughout most of the subbasin. The only exceptions are in the South Fork drainage above Izee Falls – an impassible barrier – and in the Lower John Day area where high temperatures and low flows are widespread, restricting the current distribution.

The Lower John Day population includes steelhead-supporting tributaries to the John Day downstream of the South Fork John Day River, including Pine Creek, Bologna Creek and Grass Valley Canyon. This widespread population is the most differentiated ecologically from other populations, occupying the lower, drier, Columbia Plateau ecoregion. This habitat divergence was the primary factor in delineating this population.

With some exceptions, the recent five-year average (geometric mean) abundance for natural steelhead within this ESU was higher than levels reported in the 1999 status review. Returns to the Yakima River, Deschutes River, and sections of the John Day River system are up substantially in comparison to 1992 to 1997. Recent five-year geometric mean annual returns to the John Day Subbasin are generally below the corresponding mean returns reported in previous status reviews. Despite episodic increases in abundance, the total population has been trending downward since 1958.

Empirical data collected by ODFW showed an average population size of 3,355 adults from 1992-1997 and an average population size of 6,139 adults from 1999-2003.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Naturally spawning summer steelhead in the John Day system are included in the Middle Columbia River Steelhead DPS which was listed as Threatened under the ESA in 1999.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette arrives at a designation of Primary.
- **Current Viability Rating:** Unknown
- **Recovery Goal for Abundance:** Unknown
- **NOAA Interim Abundance Target:** 3,200
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (from EDT):** Productivity: 4.83, Capacity: 4,293

2.2 Current Hatchery Programs Affecting this Population

No hatcheries currently collect or release summer steelhead in the John Day system.

Out-of-DPS hatchery strays are approximately 5% of the naturally spawning of this population. This has been recognized as a risk to the population (Mid-Columbia Steelhead Recovery Plan-ODFW 2007 draft).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from out-of-basin hatchery programs: 302 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.8 to 4.4. Average abundance of natural-origin spawners (NOS) would increase from approximately 2,369 fish to approximately 3,364 fish. Harvest contribution of the natural population would go from approximately 242 fish to approximately 343 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations)

that appeared to be consistent with manager’s goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Hatchery strays from out-of-basin reportedly have exceeded 5% of the natural spawning population.

Recommendations

The HSRG recommends increased monitoring of spawning abundance and composition. Implement additional actions to reduce the proportion hatchery strays in the natural spawning population.

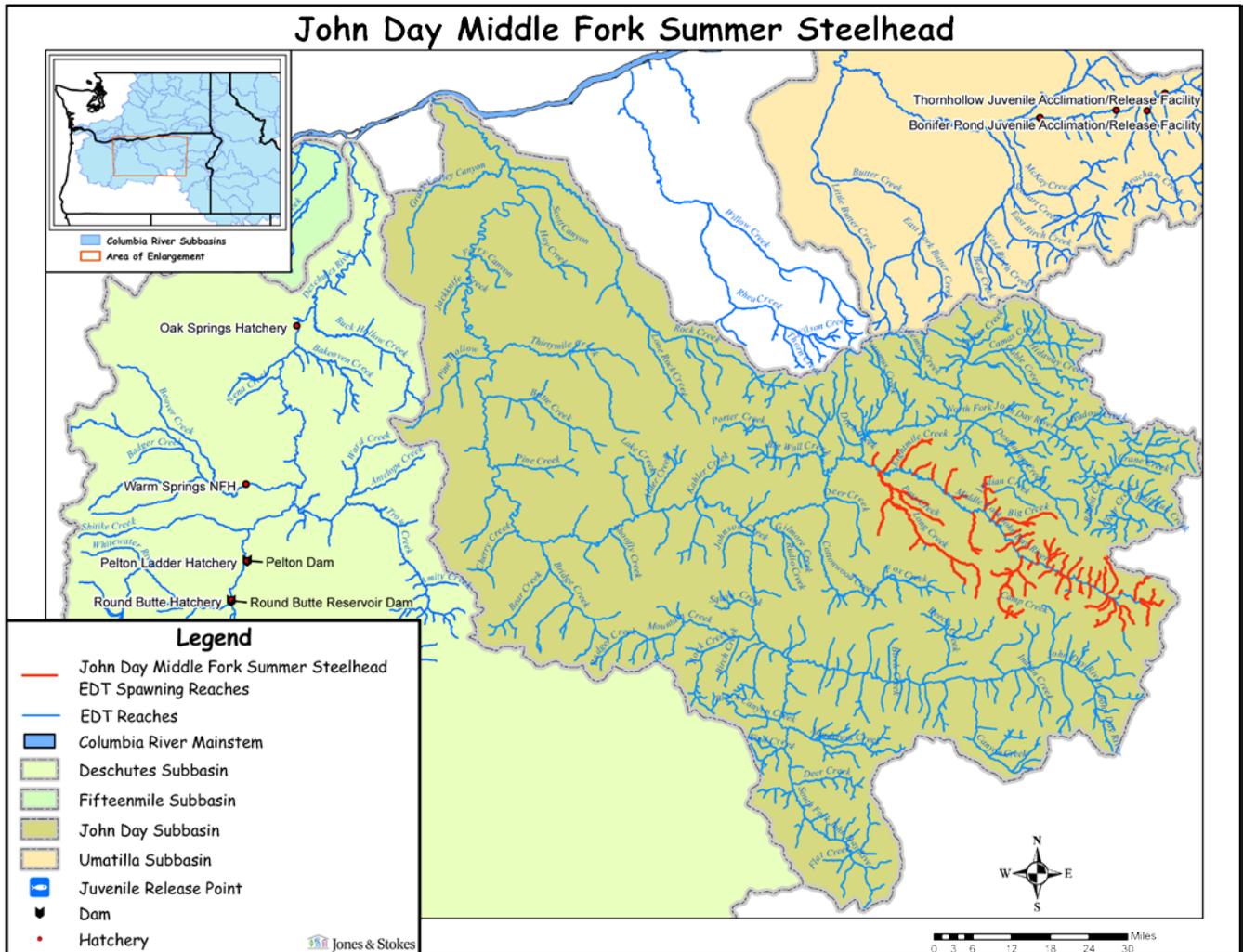
Table 1. Results of HSRG analysis of current condition and HSRG Solution for John Day Lower Mainstem Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 5% | 0.00 | 2,369 | 2.8 | 242 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 3,364 | 4.4 | 343 | - |
| HSRG Solution | None None | - | 0% | 50% | 2% | 0.00 | 3,098 | 3.9 | 316 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 50% | 1% | 0.00 | 3,558 | 4.4 | 363 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

John Day-Middle Fork Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 John Day-Middle Fork Summer Steelhead

The Interior Columbia Basin Technical Recovery Team (TRT) defined the John Day River as a major grouping based primarily on subbasin topography and distance from other spawning aggregates (NOAA Fisheries 2003). This subbasin is one of the few remaining summer steelhead streams in the interior Columbia Basin that have had little influence from introduced hatchery fish and that have more recently been classified as strong or healthy (Lee et al. 1997, Huntington et al. 1994). Within this major grouping the TRT defined five populations on the basis of genetic information, demographic correlations, and habitat/ecoregion data. Spawning areas are widely distributed across tributary and mainstem habitats but are not well documented. Steelhead are widely distributed throughout most of the subbasin. The only exceptions are in the South Fork drainage above Izee Falls – an impassible barrier – and in the Lower John Day area where high temperatures and low flows are widespread, restricting the current distribution.

Spawning areas in the Middle Fork John Day River are well separated from all other spawning areas, with the exception of the North Fork John Day. This distance, coupled with habitat differences between this population and the North Fork population, and general subbasin topography led to independent population designation for this area. The population includes the Middle Fork John Day and all its tributaries.

With some exceptions, the recent five-year average (geometric mean) abundance for natural steelhead within this ESU was higher than levels reported in the 1999 status review. Returns to the Yakima River, Deschutes River, and sections of the John Day River system are up substantially in comparison to 1992 - 1997. Recent five-year geometric mean annual returns to the John Day Subbasin are generally below the corresponding mean returns reported in previous status reviews. Despite episodic increases in abundance, the total population has been trending downward since 1958.

Empirical data collected by ODFW showed an average population size of 1,534 adults from 1992-1997 and an average population of 2,806 adults from 1999-2003.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Naturally spawning Summer Steelhead in the John Day system are included in the Middle Columbia River Steelhead DPS which was listed as Threatened under the ESA in 1999.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette arrives at a designation of Primary.
- **Current Viability Rating:** Unknown
- **Recovery Goal for Abundance:** Unknown
- **NOAA Interim Abundance Target:** 1,300
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (from EDT):** Productivity: 3.89, Capacity: 1,712

2.2 Current Hatchery Programs Affecting this Population

No hatcheries currently collect or release summer steelhead in the John Day system.

Out-of-DPS hatchery strays are approximately 5% of the naturally spawning population. This has been recognized as a risk to the population (Mid-Columbia Steelhead Recovery Plan-ODFW 2007 draft).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from out-of-basin hatchery programs: 112 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.2 to 3.5. Average abundance of natural-origin spawners (NOS) would increase from approximately 829 fish to approximately 1,244 fish. Harvest contribution of the natural population would go from approximately 85 fish to approximately 127 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations)

that appeared to be consistent with manager’s goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Hatchery strays from out-of-basin reportedly have exceeded 5% of the natural spawning population.

Recommendations

The HSRG recommends that managers increase monitoring of spawning abundance and composition. Implement additional actions to reduce the proportion hatchery strays in the natural spawning population.

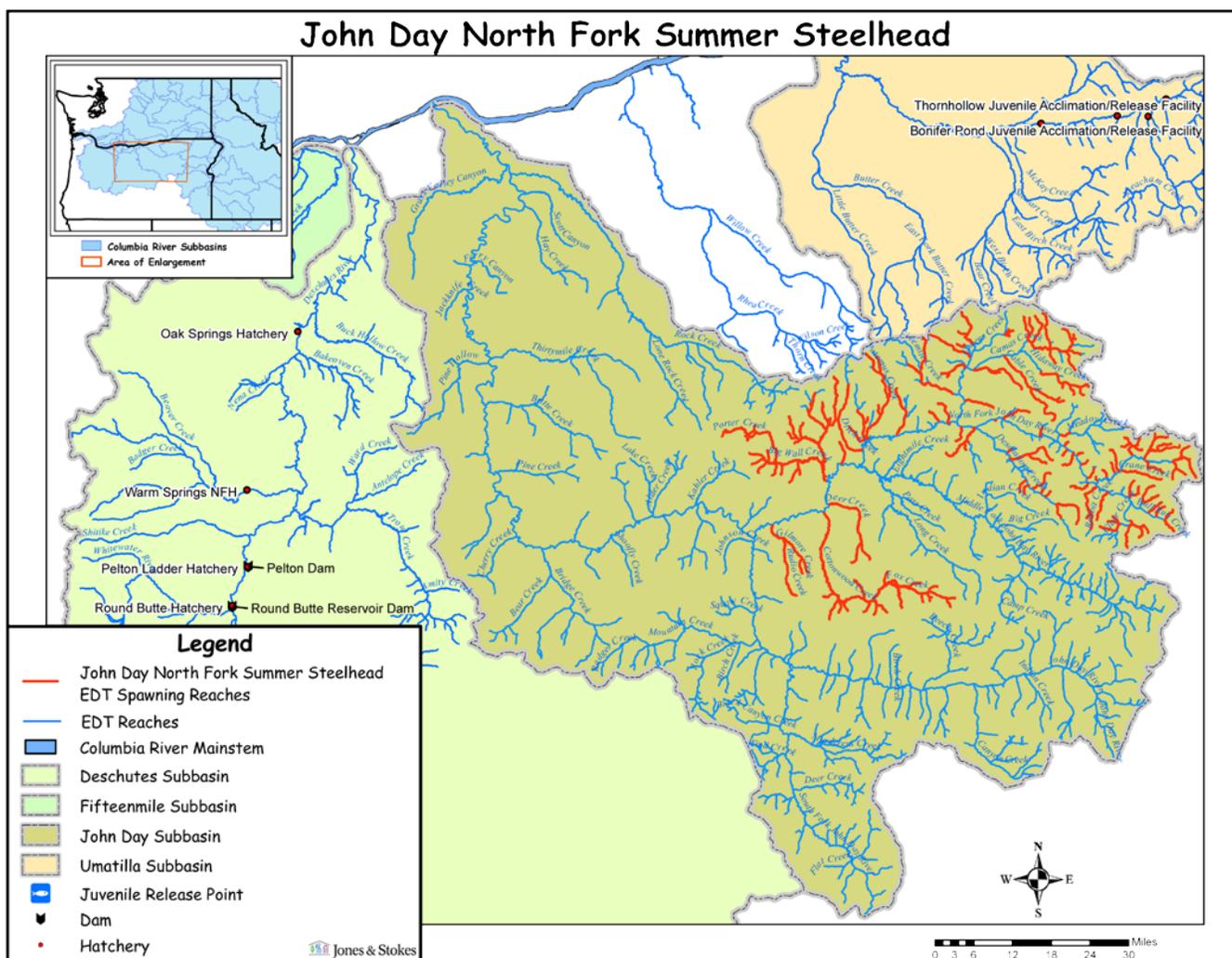
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Middle Fork John Day Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 5% | 0.00 | 829 | 2.2 | 85 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,244 | 3.5 | 127 | - |
| HSRG Solution | None None | - | 0% | 50% | 2% | 0.00 | 1,137 | 3.1 | 116 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 50% | 1% | 0.00 | 1,323 | 3.5 | 135 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

John Day-North Fork Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 John Day-North Fork Summer Steelhead

The Interior Columbia Basin Technical Recovery Team (TRT) defined the John Day River as a major grouping based primarily on subbasin topography and distance from other spawning aggregates (NOAA Fisheries 2003). This subbasin is one of the few remaining summer steelhead streams in the interior Columbia Basin that have had little influence from introduced hatchery fish and that have more recently been classified as strong or healthy (Lee et al. 1997, Huntington et al. 1994). Within this major grouping the TRT defined five populations on the basis of genetic information, demographic correlations, and habitat/ecoregion data. Spawning areas are widely distributed across tributary and mainstem habitats but are not well documented. Steelhead are widely distributed throughout most of the subbasin. The only exceptions are in the South Fork drainage above Izee Falls – an impassible barrier – and in the Lower John Day area where high temperatures and low flows are widespread, restricting the current distribution.

The TRT defined this population on the basis of habitat characteristics, subbasin topography and demographic patterns. The North Fork occupies the highest elevation, wettest area in the John Day subbasin. In addition, it encompasses sufficient habitat to support an independent population. Finally, Chilcote (2001) investigated population trajectories in the John Day (and other Oregon rivers). He found that the upper North Fork index count was the most divergent of the John Day stocks. This combination of factors supports this population delineation. It includes the mainstem North Fork John Day River and its tributaries.

With some exceptions, the recent five-year average (geometric mean) abundance for natural steelhead within this ESU was higher than levels reported in the 1999 status review. Returns to the Yakima River, Deschutes River, and sections of the John Day River system are up substantially in comparison to 1992 to 1997. Recent five-year geometric mean annual returns to the John Day subbasin are generally below the corresponding mean returns reported in previous status reviews. Despite episodic increases in abundance, the total population has been trending downward since 1958.

Empirical data collected by ODFW showed an average population size of 3,345 adults from 1992-1997 and an average population size of 6,120 adults from 1999-2003.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Naturally spawning Summer Steelhead in the John Day system are included in the Middle Columbia River Steelhead DPS which was listed as Threatened under the ESA in 1999.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette arrives at a designation of Primary.
- **Current Viability Rating:** Unknown
- **Recovery Goal for Abundance:** Unknown
- **NOAA Interim Abundance Target:** 2,700

- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity (from EDT): Productivity: 3.82, Capacity: 3,925

2.2 Current Hatchery Programs Affecting this Population

No hatcheries currently collect or release summer steelhead in the John Day system.

Out-of-DPS hatchery strays are approximately 5% of the naturally spawning population. This has been recognized as a risk to the population (Mid-Columbia Steelhead Recovery Plan-ODFW 2007 draft).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from out-of-basin hatchery programs: 223 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.4 to 3.5. Average abundance of natural-origin spawners (NOS) would increase from approximately 2,019 fish to approximately 2,832 fish. Harvest contribution of the natural population would go from approximately 206 fish to approximately 289 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager’s goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations
Hatchery strays have exceeded 5% of the natural spawning population.

Recommendations
The HSRG recommends that managers increase monitoring of spawning abundance and composition. Implement actions if necessary to reduce the proportion hatchery strays in the natural spawning population.

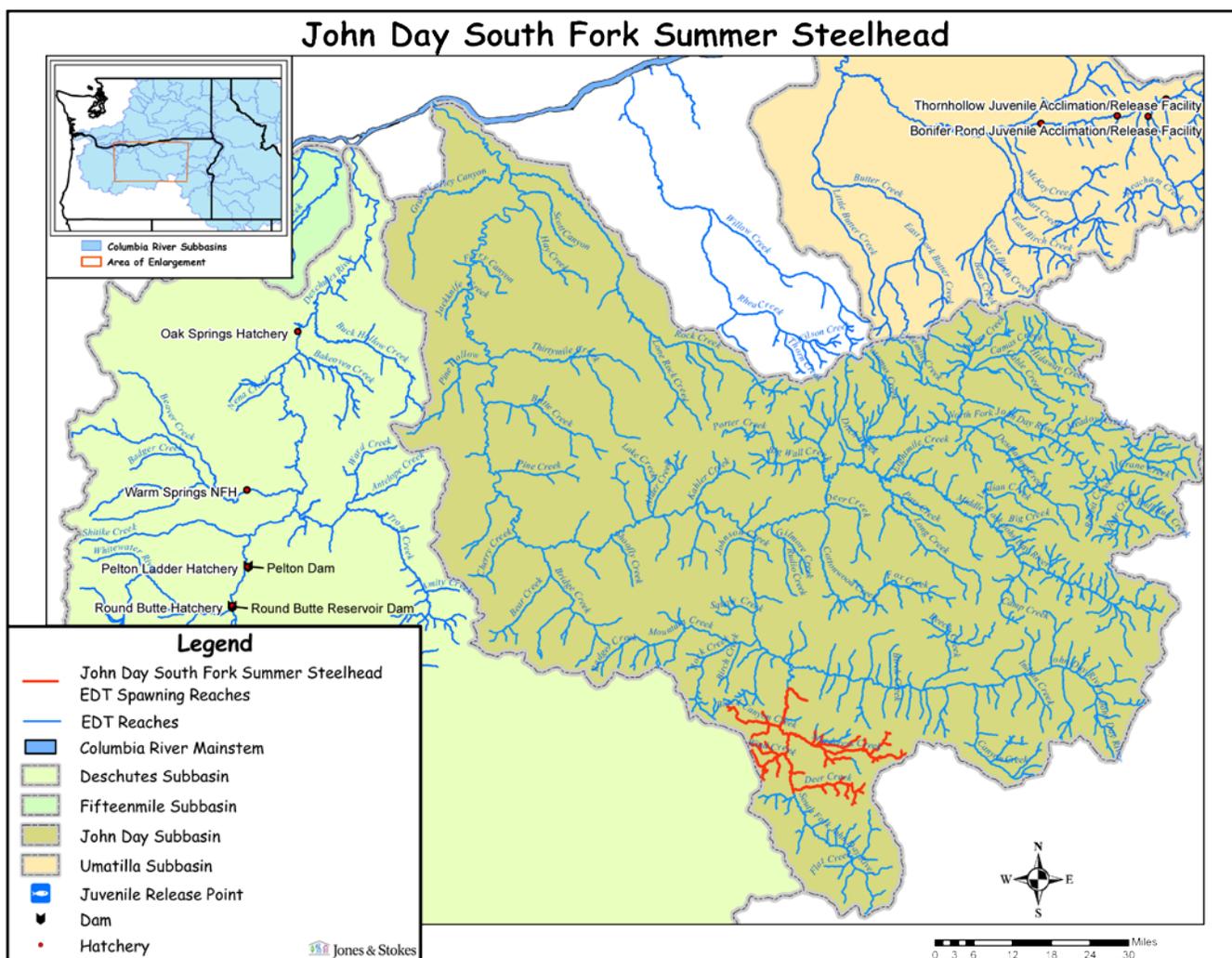
Table 1. Results of HSRG analysis of current condition and HSRG Solution for North Fork John Day Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 4% | 0.00 | 2,019 | 2.4 | 206 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 2,832 | 3.5 | 289 | - |
| HSRG Solution | None None | - | 0% | 50% | 1% | 0.00 | 2,630 | 3.2 | 268 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 50% | 1% | 0.00 | 3,054 | 3.5 | 312 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

John Day-South Fork Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 John Day-South Fork Summer Steelhead

The Interior Columbia Basin Technical Recovery Team (TRT) defined the John Day River as a major grouping based primarily on subbasin topography and distance from other spawning aggregates (NOAA Fisheries 2003). This subbasin is one of the few remaining summer steelhead streams in the interior Columbia Basin that have had little influence from introduced hatchery fish and that have more recently been classified as strong or healthy (Lee et al. 1997, Huntington et al. 1994). Within this major grouping, the TRT defined five populations on the basis of genetic information, demographic correlations, and habitat/ecoregion data. Spawning areas are widely distributed across tributary and mainstem habitats, but are not well documented. Steelhead are widely distributed throughout most of the subbasin. The only exceptions are in the South Fork drainage above Izee Falls – an impassible barrier – and in the Lower John Day area where high temperatures and low flows are widespread, restricting the current distribution.

Genetic data indicate that *O. mykiss* from the South Fork John Day River may include the anadromous form that are differentiated from those in other parts of the John Day (Currens et al. 1985). The TRT delineated this as an independent population on the basis of this genetic information as well as subbasin topography. The species assemblage in the South Fork is also unique.

With some exceptions, the recent five-year average (geometric mean) abundance for natural steelhead within this ESU was higher than levels reported in the 1999 status review. Returns to the Yakima River, Deschutes River, and sections of the John Day River system are up substantially in comparison to 1992 to 1997. Recent five-year geometric mean annual returns to the John Day subbasin are generally below the corresponding mean returns reported in previous status reviews. Despite episodic increases in abundance, the total population has been trending downward since 1958.

Empirical data collected by ODFW showed an average population size of 690 adults from 1992-1997 and an average size of 1,262 adults from 1999-2003.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Naturally spawning Summer Steelhead in the John Day system are included in the Middle Columbia River Steelhead DPS which was listed as Threatened under the ESA in 1999.
- Population Designation: Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette arrives at a designation of Contributing.
- Current Viability Rating: Unknown
- Recovery Goal for Abundance: Unknown
- NOAA Interim Abundance Target: 600
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity (from EDT): Productivity: 3.25, Capacity: 625

2.2 Current Hatchery Programs Affecting this Population

No hatcheries currently collect or release summer steelhead in the John Day system.

Out-of-DPS hatchery strays are approximately 5% of the naturally spawning population. This has been recognized as a risk to the population (Mid-Columbia Steelhead Recovery Plan- ODFW 2007 draft).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from out-of-basin hatchery programs: 42 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.1 to 3.0. Average abundance of natural-origin spawners (NOS) would increase from approximately 311 fish to approximately 419 fish. Harvest contribution of the natural population would go from 32 fish to approximately 43 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations)

that appeared to be consistent with manager’s goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations
Hatchery strays have exceeded 5% of the natural spawning population.

Recommendations
The HSRG recommends that managers increase monitoring of spawning abundance and composition. Implement actions if necessary to reduce the proportion hatchery strays in the natural spawning population.

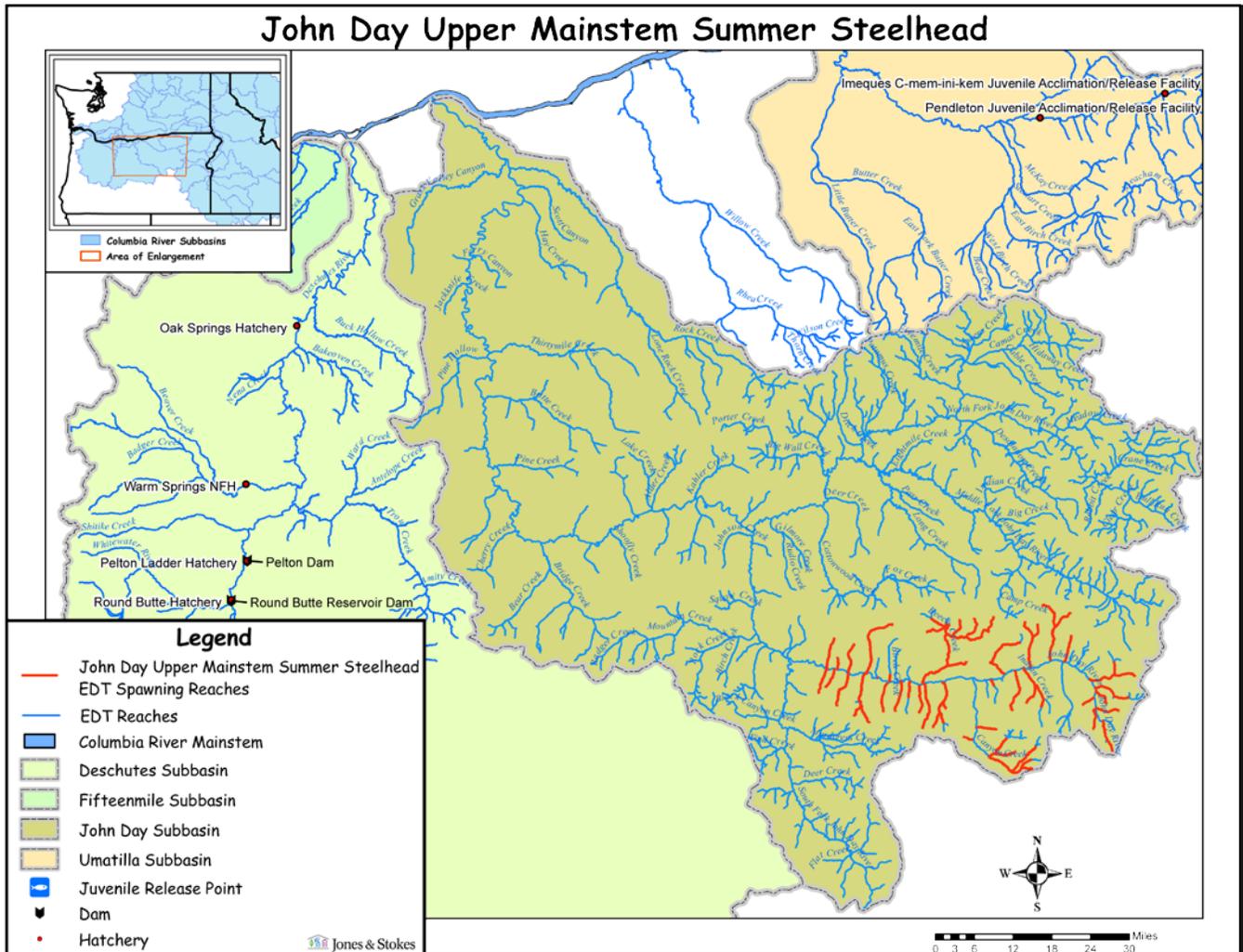
Table 1. Results of HSRG analysis of current condition and HSRG Solution for North Fork John Day Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 4% | 0.00 | 311 | 2.1 | 32 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 419 | 3.0 | 43 | - |
| HSRG Solution | None None | - | 0% | 0% | 3% | 0.00 | 325 | 2.2 | 33 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 3% | 0.00 | 399 | 2.6 | 41 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

John Day-Upper Mainstem Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 John Day-Upper Mainstem Summer Steelhead

The Interior Columbia Basin Technical Recovery Team (TRT) defined the John Day River as a major grouping based primarily on subbasin topography and distance from other spawning aggregates (NOAA Fisheries 2003). This subbasin is one of the few remaining summer steelhead streams in the interior Columbia Basin that have had little influence from introduced hatchery fish and that have more recently been classified as strong or healthy (Lee et al. 1997, Huntington et al. 1994). Within this major grouping, the TRT defined five populations on the basis of genetic information, demographic correlations, and habitat/ecoregion data. Spawning areas are widely distributed across tributary and mainstem habitats, but are not well documented. Steelhead are widely distributed throughout most of the subbasin. The only exceptions are in the South Fork drainage above Izee Falls – an impassible barrier – and in the Lower John Day area where high temperatures and low flows are widespread, restricting the current distribution.

The Upper Mainstem John Day River population includes the mainstem John Day River and tributaries upstream from the South Fork. It is separated from the lower mainstem on the basis of habitat differences and from the South Fork on the basis of topography (John Day Subbasin Plan 2004).

With some exceptions, the recent five-year average (geometric mean) abundance for natural steelhead within this DPS was higher than levels reported in the 1999 status review. Returns to the Yakima River, Deschutes River, and sections of the John Day River system are up substantially in comparison to 1992 to 1997. Recent five-year geometric mean annual returns to the John Day Subbasin are generally below the corresponding mean returns reported in previous status reviews. Despite episodic increases in abundance, the total population has been trending downward since 1958.

Empirical data collected by ODFW showed an average population size of 1,369 adults from 1992-1997 and an average size of 2,505 adults from 1999-2003.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Naturally spawning summer steelhead in the John Day system are included in the Middle Columbia River Steelhead DPS which was listed as Threatened under the ESA in 1999.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette arrives at a designation of Contributing.
- **Current Viability Rating:** Unknown
- **Recovery Goal for Abundance:** Unknown
- **NOAA Interim Abundance Target:** 2,000
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (from EDT):** Productivity: 3.4, Capacity: 1,270

2.2 Current Hatchery Programs Affecting this Population

No hatcheries currently collect or release summer steelhead in the John Day system.

Out-of-DPS hatchery strays are approximately 5% of the naturally spawning population. This has been recognized as a risk to the population (Mid-Columbia Steelhead Recovery Plan- ODFW 2007 draft).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from out-of-basin hatchery programs: 74 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.1 to 3.1. Average abundance of natural-origin spawners (NOS) would increase from approximately 607 fish to approximately 869 fish. Harvest contribution of the natural population would go from approximately 62 fish to approximately 89 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations)

that appeared to be consistent with manager’s goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations
Hatchery strays have exceeded 5% of the natural spawning population.

Recommendations
The HSRG recommends that managers increase monitoring of spawning abundance and composition. Implement actions if necessary to reduce the proportion hatchery strays in the natural spawning population.

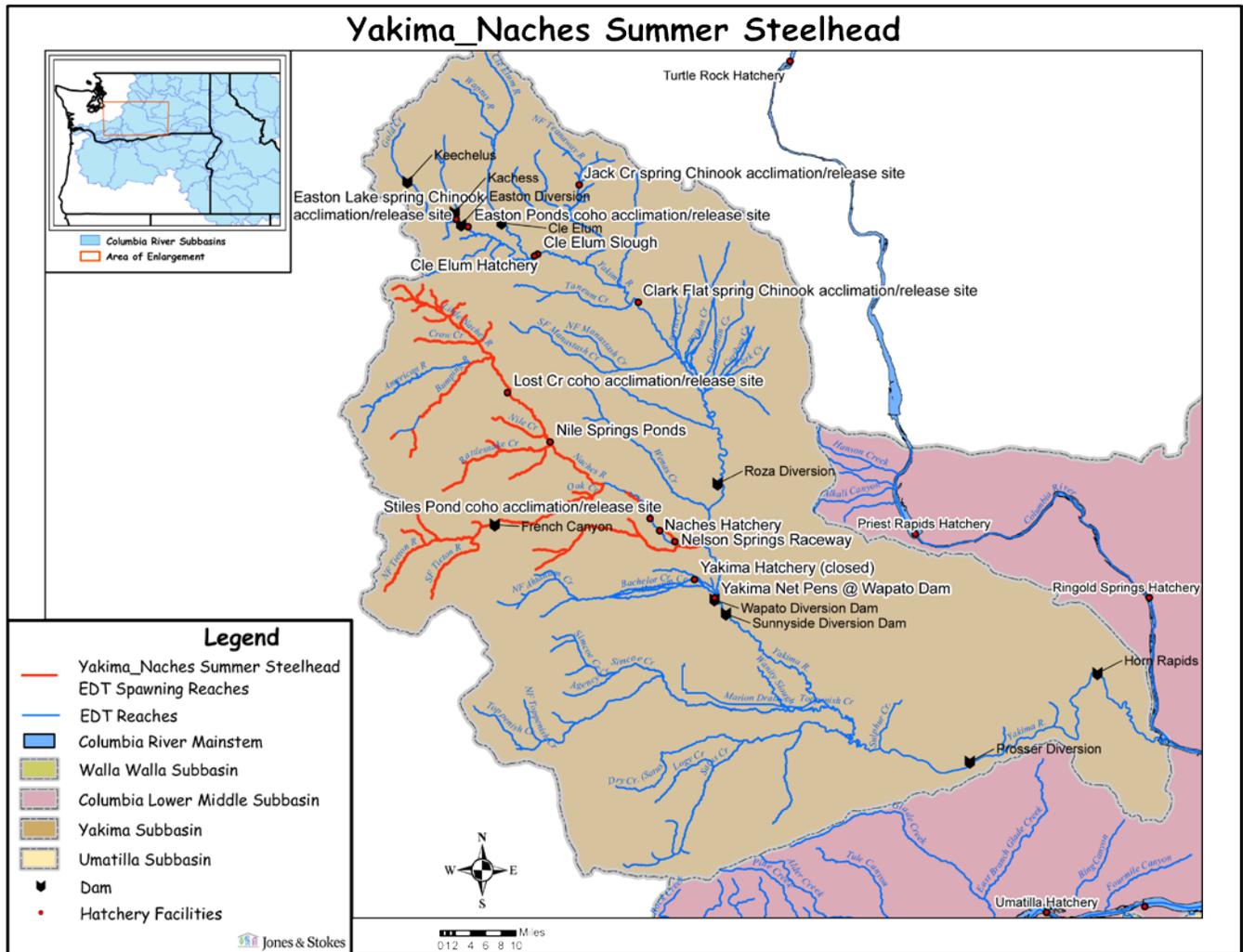
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Upper Mainstem John Day Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 4% | 0.00 | 607 | 2.1 | 62 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 869 | 3.1 | 89 | - |
| HSRG Solution | None None | - | 0% | 0% | 3% | 0.00 | 673 | 2.3 | 69 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 3% | 0.00 | 825 | 2.7 | 84 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Naches Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Naches Summer Steelhead

The Yakima subbasin supports four genetically and demographically distinct stocks of summer steelhead, the Satus Creek stock, the Naches River stock, the Toppenish Creek stock, and the upper Yakima stock. Hockersmith et al (1995) successfully monitored 105 radio-tagged steelhead to spawning over brood years 1990 – 1992. Because high flows and turbidity in the Naches and Yakima mainstem during steelhead spawning precludes visual redd counts, this radio-tagging data has been the only means of determining the overall stock composition of the run. Over all three years, the mean percent of radio tagged fish that spawned in Satus Creek, the Naches River watershed, Toppenish Creek, and the upper Yakima was 48.0%, 31.6%, 13.3% and 7.1%, respectively.

Estimates of the size of the historical Yakima steelhead run range from 20,800 (Kreeger and McNeil 1993) to 100,000 (Smoker 1956). The historic distribution of spawning likely differs from the proportions found by Hockersmith (1995) because large amounts of habitat have been lost due to impassible dams in the upper Yakima and Naches drainages, and because anthropogenic impacts to habitat and passage conditions in the upper Yakima favor the resident over the anadromous life history type. With this caveat in mind, the product of the current estimate of the proportion of Naches spawners and the two historical total abundance estimates is 6,573 and 31,600. The mean abundance of steelhead in the Naches watershed from 1985 to 2007 was 595; however, like all Yakima steelhead populations, the Naches population has increased substantially since 2000 (mean abundance from 1985 to 2000 was 460; mean abundance from 2001 to 2007 was 861).

Many hatchery *O. mykiss* have been released in the Yakima subbasin. Three million hatchery trout (primarily South Tacoma and Goldendale stock) were planted in the upper Yakima and Naches between 1950 and 1987, and 1.6 million hatchery steelhead (primarily Skamania stock) were planted in the same watersheds between 1961 and 1987. After 1987, no out-of-basin hatchery steelhead were released in the Yakima subbasin, although experimental releases of 40,000 to 100,000 hatchery-reared Yakima stock steelhead were made between 1987 and 1994. The 1991 to 1994 releases were made in the North Fork Teanaway River, an Upper Yakima tributary. Between 1995 and 1999, there were no hatchery steelhead programs in the Yakima subbasin. A kelt reconditioning program at Prosser Hatchery on the lower Yakima (RM 47) began on a test basis in 1999 and moved into full production in 2001. This is the only steelhead artificial production program currently in operation in the Yakima subbasin (see below). Because the program collects kelts at Prosser Dam, below the natal watersheds of all four Yakima steelhead stocks, it is very likely that Naches River fish are included.

Although the entire Yakima subbasin was closed to steelhead fishing in 1994, considerable illegal and/or inadvertent steelhead harvest is believed to occur during the winter whitefish fishery, especially in steelhead staging areas off the mouths of Satus and Toppenish creeks. A terminal harvest rate of 8% has been estimated (C. Frederickson, Yakama Nation, personal communication 2007).

With the exception of the Tieton River and probably the American River, summer steelhead spawn in virtually all of the accessible tributaries in the Naches watershed, but especially in the Little Naches River and its tributaries, Rattlesnake Creek and tributaries, and the Bumping River. Spawning also occurs throughout the mainstem Naches. Curiously, very few if any steelhead spawn in the American River, which is very heavily utilized by spring Chinook. None of Hockersmith's radio-tagged adults spawned in the American River, and Yakama Nation biologists very rarely observed juvenile *O. mykiss* in the American River during numerous electroshocking surveys and censuses (J. Hubble, Yakama Nation, personal communication,

2007). Spawning does not occur in the Tieton River because very large releases of irrigation water from Rimrock Reservoir have drastically reduced the amount of spawning substrate. It is not known why few or no steelhead spawn in the American River.

Spawning occurs over a fairly wide period due to the range of elevations and seasonal water temperatures in the watershed. At the lowest elevations, spawning begins in early March while, at the highest elevations, spawning can continue into June (Yakima Subbasin Plan).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Native upper Yakima summer steelhead are part of the Middle Columbia Steelhead DPS, which were listed as a threatened species on March 25, 1999.
- Population Designation: Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette arrives at a designation of Primary.
- Current Viability Rating: Moderate to high risk of extinction (Yakima Subbasin Salmon Recovery Plan)
- Recovery Goal for Abundance: 2,000 (rated “large” by ICTRT)
- Productivity Improvement Expectation: 2.0 (C. Frederickson, Yakama Nation, personal communication)
- Habitat Productivity and Capacity (from EDT): Productivity: 1.63; Capacity: 2,056

2.2 Current Hatchery Programs Affecting this Population

The Prosser Hatchery kelt reconditioning program is the only steelhead artificial production program in the basin. The Yakima Basin Steelhead Reconditioning Project HGMP (2005) summarized the program as follows. Steelhead kelts are collected at the Chandler smolt trap at Prosser Dam (RM 47) and subjected to short- and long-term reconditioning and release. Because Prosser Dam lies below all four steelhead populations, the kelts collected and reconditioned presumably represent a sample of all of the stocks in the basin. Under long-term reconditioning, kelts are captured at the Chandler smolt trap between March and June, reconditioned on-site for 6 to 8 months, and released back into the Yakima River at Prosser Dam the following December. Mean weight gain for surviving long-term kelts was approximately 70% over collection weight in 2000-2001, and many fish more than doubled their weight. Collection procedures are identical for short-term reconditioning, but fish are held only 1-2 months and are released below Bonneville Dam. Short-term kelts gain very little weight during their brief reconditioning period, and are expected to recondition naturally in the estuary and/or ocean and eventually return to the Yakima subbasin. Six short-term kelts released below Bonneville Dam in May of 2002 returned in the fall of 2002 and were recaptured in the Denil ladder at Prosser Dam. The mean weight gain of these fish after 5-6 months of natural reconditioning was about 46%.

A total of 867 kelts were captured from 2002 to 2004 and subjected to short-term reconditioning, and 2,147 kelts were collected from 2001 to 2004 and subjected to long-term reconditioning. Kelts are collected throughout the migration period for both programs. Based on Prosser Dam counts from July 1, 2000 to March 7, 2005, reconditioned kelts represented about 24% of the entire Yakima River population. Program managers anticipate reconditioning no more than 1,000 to 1,200 kelts per year or, given recent returns, about 25-35 % of the natural run.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 4 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain unchanged at 1.4. Average abundance of natural-origin spawners (NOS) would increase slightly from 521 to 562 recruits per spawner. Harvest contribution of the natural and hatchery populations would increase from 85 to 91 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Recent spawning surveys indicate there is more spawning than previously thought.

There is an experimental kelt (post-spawned steelhead) reconditioning program that may affect steelhead in the Yakima subbasin.

Recommendations

The HSRG recommends that managers continue to monitor for spawning success of reconditioned kelts. We have no other specific recommendations for this program.

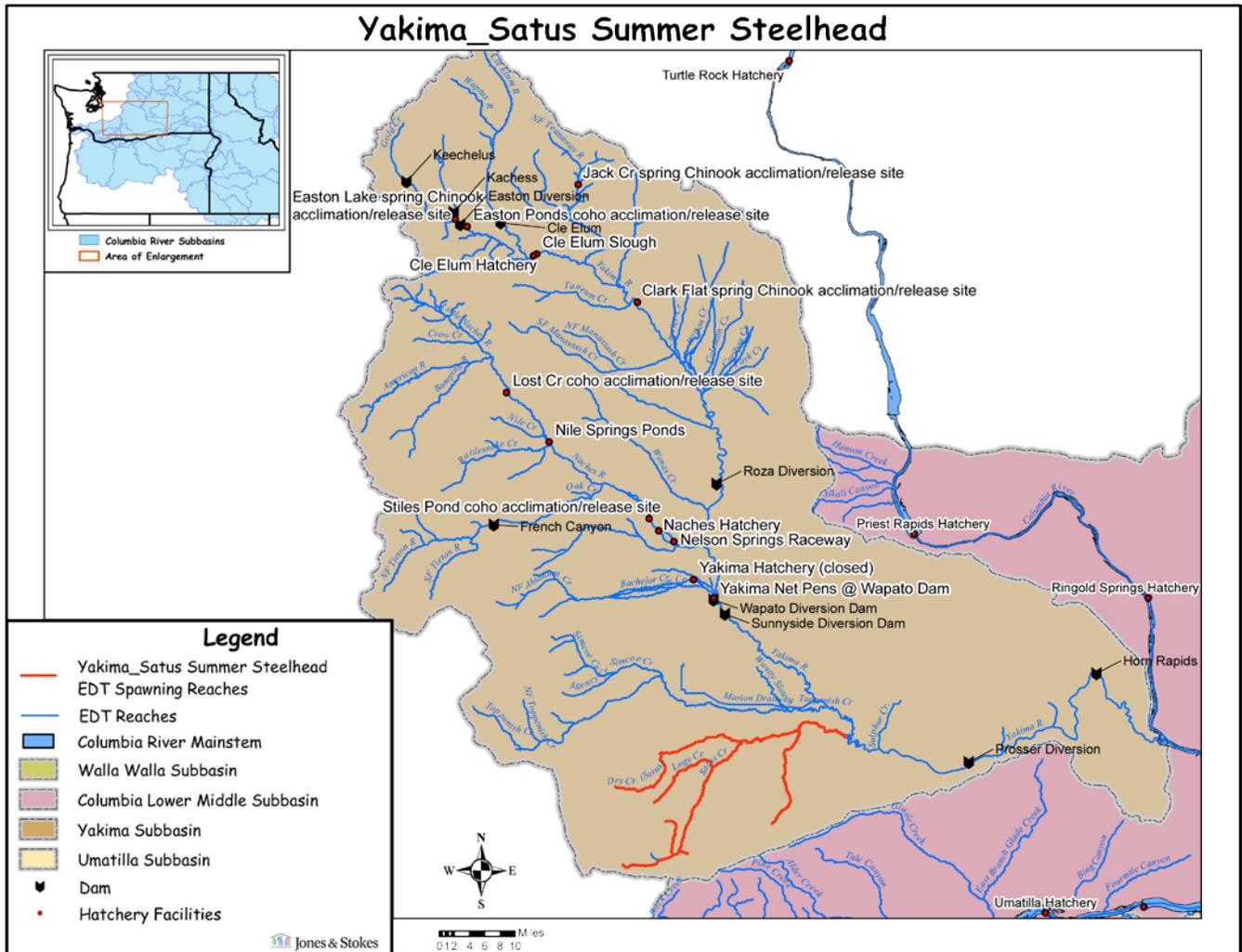
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Naches Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | 0.0 | 0% | 0% | 1% | 0.00 | 521 | 1.4 | 85 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | 0.0 | 0% | 0% | 0% | 1.00 | 562 | 1.4 | 91 | - |
| HSRG Solution | None None | 0.0 | 0% | 0% | 0% | 1.00 | 559 | 1.4 | 91 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | 0.0 | 0% | 0% | 0% | 1.00 | 758 | 1.6 | 123 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Satus Creek Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Satus Creek Summer Steelhead

The Yakima subbasin supports four genetically and demographically distinct stocks of summer steelhead, the Satus Creek stock, the Naches River stock, the Toppenish Creek stock, and the upper Yakima stock. Hockersmith et al (1995) successfully monitored 105 radio tagged steelhead to spawning over brood years 1990 – 1992. Because high flows and turbidity in the Naches and Yakima mainstem during steelhead spawning precludes visual redd counts, this radio tagging data has been the only means of determining the overall stock composition of the run. Over all three years, the mean percent of radio tagged fish that spawned in Satus Creek, the Naches River watershed, Toppenish Creek, and the upper Yakima was 48.0%, 31.6%, 13.3% and 7.1%, respectively.

The estimated size of the historic Yakima steelhead run ranges from 20,800 (Kreeger and McNeil 1993) to 100,000 (Smoker 1956). The historical spawning distribution likely differed from the proportions found by Hockersmith (1995) because large habitat areas have been lost due to the impassible dams in the upper Yakima and Naches drainages, and because of anthropogenic impacts to habitat and passage conditions in the upper Yakima that favor the resident over the anadromous life history type. With this caveat in mind, if the historical Satus Creek population represented 48% of all Yakima Subbasin steelhead, then the Kreeger and McNeil estimate of historical Satus Creek steelhead production would be $0.48 * 20,800$ or 9,984, and the Smoker estimate would be $0.48 * 100,000$ or 48,000. The mean abundance of steelhead in the Satus Creek watershed from 1985 – 2007 was 748. However, like all Yakima steelhead populations, the Satus Creek population has increased substantially since 2000. Based on Prosser Dam counts and the 1990-1992 proportions, mean abundance from 1985 to 2000 was 669; mean abundance from 2001 to 2007 was 929.

Hatchery-reared *O. mykiss* have never been released in Satus Creek and there is no plan to do so in the future. A kelt reconditioning program at Prosser Hatchery on the lower Yakima (RM 47) began on a test basis in 1999 and moved into full production in 2001. This is the only steelhead artificial production program currently in operation in the Yakima subbasin (see below). Because the program collects kelts at Prosser Dam, which is below the natal watersheds of all four Yakima steelhead stocks, it is very likely that Satus Creek fish are included.

Although the entire Yakima subbasin was closed to steelhead fishing in 1994, considerable illegal and/or inadvertent steelhead harvest is believed to occur during the winter whitefish fishery, especially in steelhead staging areas off the mouths of Satus and Toppenish creeks. A terminal harvest rate of 8% has been estimated (C. Frederiksen, Yakama Nation, personal communication 2007).

Satus Creek steelhead are different from all other Yakima steelhead stocks in a number of respects. First, in part because Satus Creek is the lowest and warmest steelhead watershed in the subbasin, spawning begins earlier (February) than in other reaches, emergence occurs earlier (May), and the growth rate is more rapid (J. Hubble M.S. Thesis). Probably as a consequence of this accelerated life history, Satus Creek smolts are considerably younger than smolts from any other Yakima population. As determined by analysis of smolt scales, 42% of Satus Creek smolts are yearlings, whereas the proportion of yearling smolts from the other populations ranges from 10 – 14%. Significantly, the proportion of yearling Satus Creek smolts as determined by analysis of *adult otoliths* is only 37%. The proportions of yearling smolts estimated from adult otoliths in the other population ranges from 0 – 17%. These observations support the idea that early emergence and rapid growth of Satus Creek steelhead accelerates the age of smoltification

relative to the other populations and increases the proportion of yearling smolts. The smolt-to-adult survival of yearling smolts is less than for 2+ smolts, reflecting a trade-off in productivity for Satus steelhead: productivity increases because yearling smolts avoid an additional year in fresh water, but yearling smolts also are less likely to return and spawn. Finally, Satus Creek steelhead spawn in almost all reaches and tributaries of Satus Creek, including intermittent tributaries. An accelerated pre-smolt life history is clearly advantageous for fish that spawn in intermittent tributaries.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Native Status summer steelhead are part of the Middle Columbia Steelhead DPS, and were listed as a threatened species on March 25, 1999.
- Population Designation: Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette arrives at a designation of Primary.
- Current Viability Rating: Moderate Risk of Extinction (Yakima Subbasin Salmon Recovery Plan)
- Recovery Goal for Abundance: 1,000 (rated “Intermediate” by ICTRT).
- Productivity Improvement Expectation: 2.1 (C Frederiksen, Yakama Nation, personal communication).
- Habitat Productivity and Capacity (from EDT): Productivity: 4.28; Capacity: 1,247

2.2 Current Hatchery Programs Affecting this Population

The Prosser Hatchery kelt reconditioning program is the only steelhead artificial production program in the basin. The Yakima Basin Steelhead Reconditioning Project HGMP (2005) summarized the program as follows. Steelhead kelts are collected at the Chandler smolt trap at Prosser Dam (RM 47) and subjected to short- and long-term reconditioning and release. Because Prosser Dam lies below all four steelhead populations, the kelts collected and reconditioned presumably represent a sample of all of the stocks in the basin. Under long-term reconditioning, kelts are captured at the Chandler smolt trap between March and June, reconditioned on-site for 6 to 8 months, and released back into the Yakima River in at Prosser Dam the following December. Mean weight gain for surviving long-term kelts was approximately 70% over collection weight in 2000-2001, and many fish more than doubled their weight. Collection procedures are identical for short-term reconditioning, but fish are held only 1-2 months and are released below Bonneville Dam. Short-term kelts gain very little weight during their brief reconditioning period, and are expected to recondition naturally in the estuary and/or ocean and eventually return to the Yakima subbasin. Six short-term kelts released below Bonneville Dam in May of 2002 returned in the fall of 2002 and were recaptured in the Denil ladder at Prosser Dam. The mean weight gain of these fish after 5-6 months of natural reconditioning was about 46%.

A total of 867 kelts were captured from 2002 to 2004 and subjected to short-term reconditioning, and 2,147 kelts were collected from 2001 to 2004 and subjected to long-term reconditioning. Kelts are collected throughout the migration period for both programs. Based on Prosser Dam counts from July 1, 2000 to March 7, 2005, the grand total of reconditioned kelts represented

about 24% of the entire Yakima River population. Program managers anticipate reconditioning no more than 1,000 to 1,200 kelts per year or, given recent returns, about 25-35 % of the natural run.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 4 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 3.6 to 3.7. Average abundance of natural-origin spawners (NOS) would increase from 866 to 874. Harvest contribution of the natural and hatchery populations would increase from 141 to 142 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

There is an experimental kelt (post-spawned steelhead) reconditioning program that may affect steelhead in the Yakima subbasin.

Recommendations

Continue to monitor for spawning success of reconditioned kelts. We have no other specific recommendations for this program.

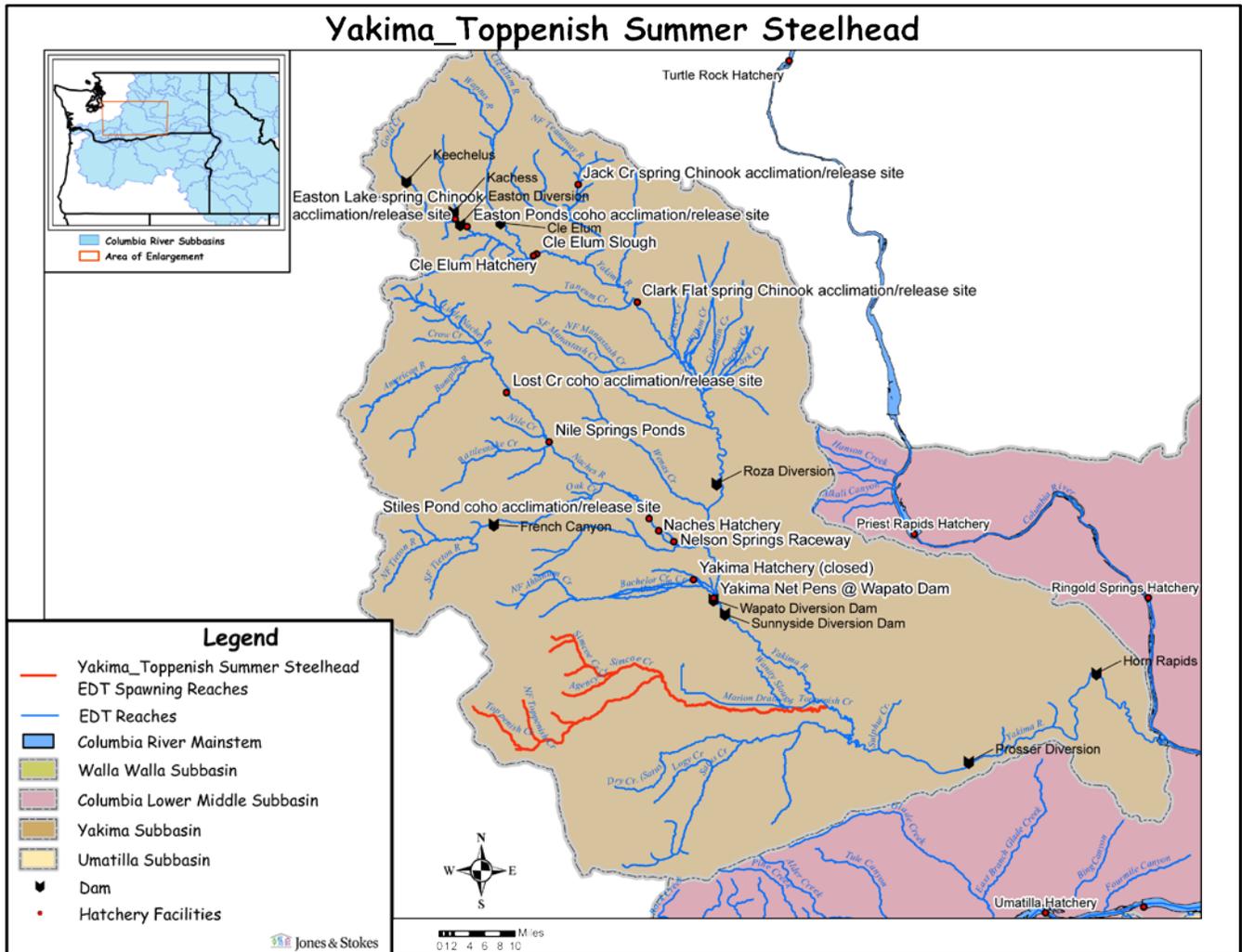
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Satus River Summer Steelhead . The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | 0.0 | 0% | 0% | 0% | 0.00 | 866 | 3.6 | 141 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | 0.0 | 0% | 0% | 0% | 0.00 | 874 | 3.7 | 142 | - |
| HSRG Solution | None None | 0.0 | 0% | 0% | 0% | 0.00 | 873 | 3.7 | 142 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | 0.0 | 0% | 0% | 0% | 0.00 | 994 | 4.0 | 161 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Toppenish Creek Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Toppenish Creek Summer Steelhead

The Yakima subbasin supports four genetically and demographically distinct stocks of summer steelhead, the Satus Creek stock, the Toppenish Creek stock, the Naches River stock and the upper Yakima stock. Hockersmith et al (1995) successfully monitored 105 radio-tagged steelhead to spawning over brood years 1990 – 1992. Because high flows and turbidity in the Naches and Yakima mainstem during steelhead spawning precludes visual redd counts, this radio-tagging data has been the only means of determining the overall stock composition of the run. Over all three years, the mean percent of radio-tagged fish that spawned in Satus Creek, the Naches River watershed, Toppenish Creek, and the upper Yakima was 48.0%, 31.6%, 13.3% and 7.1%, respectively.

Estimates of the size of the historical steelhead run range from 20,800 (Kreeger and McNeil 1993) to 100,000 (Smoker 1956). The historical spawning distribution likely did not reflect the proportions found by Hockersmith (1995) because of the large habitat loss attributable to impassible dams in the upper Yakima and Naches drainages, and because of anthropogenic impacts to habitat and passage conditions in the upper Yakima that favor the resident over the anadromous life history type. With this caveat in mind, Hockersmith's estimate of the proportion of all Yakima steelhead that spawn in Toppenish Creek was 13.3%. Thus, historical Toppenish steelhead abundance estimates range from 2,766 ($0.133 * 20,800$) for the Kreeger and McNeil historical production figure, to 13,300 ($0.133 * 100,000$) for the Smoker estimate of historical steelhead production in the Yakima Subbasin. Based on Prosser Dam counts and the 1990-1992 proportions, the mean abundance of steelhead in Toppenish Creek from 1985 to 2007 was 397. Like other Yakima steelhead populations, the Toppenish Creek population has increased substantially since 2000. Mean abundance from 1985 to 2000 was 218 while mean abundance from 2001 to 2007 was 669. It is significant that the Interior Columbia Technical Review Team (ICTRT) classed the Toppenish Creek population as Basic, for which the abundance recovery criterion is 500.

The only known release of hatchery steelhead in the Toppenish Creek watershed was a release of 25,000 hatchery-reared Yakima stock smolts in 1989. A kelt reconditioning program at Prosser Hatchery on the lower Yakima (RM 47) began on a test basis in 1999 and moved into full production in 2001. This is the only steelhead artificial production program currently in operation in the Yakima subbasin (see below). Because the program collects kelts at Prosser Dam, which is below the natal watersheds of all four Yakima steelhead stocks, it is very likely that Toppenish Creek fish are collected.

Although the entire Yakima subbasin was closed to steelhead fishing in 1994, considerable illegal and/or inadvertent steelhead harvest is believed to occur during the winter whitefish fishery, especially in steelhead staging areas off the mouths of Satus and Toppenish creeks. A terminal harvest rate of 8% has been estimated (C. Frederiksen, Yakama Nation, personal communication, 2007).

The steelhead spawning distribution in Toppenish Creek currently is restricted to the upper watershed because of habitat degradation in the lower reaches. In the mainstem Toppenish Creek, steelhead spawning begins just above the confluence of Simcoe Creek (RM 32.7) and continues at least to Panther Creek at RM 68.3. Spawning also occurs in upper Simcoe Creek, in most tributaries to Simcoe Creek, and in Toppenish Creek above the Simcoe confluence. It should be noted that several diversion dams have served as partial or intermittent barriers to adult migration in the Toppenish Creek watershed for many years. Most have been modified or

removed over the past decade. An increase in redd counts since 2000 may be related to these improvements.

Spawning occurs relatively early in Toppenish Creek because of the low elevation of much of the watershed. Depending on elevation, spawning can begin as early as late February and end as late as early May.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Native Toppenish summer steelhead are part of the Middle Columbia Steelhead DPS, which were listed as a threatened species on March 25, 1999.
- Population Designation: Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette arrives at a designation of Contributing.
- Current Viability Rating: Moderate Risk of Extinction (Yakima Subbasin Salmon Recovery Plan 2005)
- Recovery Goal for Abundance: 500 (a “Basic” population according to ICTRT)
- Productivity Improvement Expectation: 2.01 (C. Frederiksen, Yakama Nation, personal communication)
- Habitat Productivity and Capacity (from EDT): Productivity: 3.89; Capacity: 1,082

2.2 Current Hatchery Programs Affecting this Population

The Prosser Hatchery kelt reconditioning program is the only steelhead artificial production program in the basin. The Yakima Basin Steelhead Reconditioning Project HGMP (2005) summarized the program as follows. Steelhead kelts are collected at the Chandler smolt trap at Prosser Dam (RM 47) and subjected to short- and long-term reconditioning and release. Because Prosser Dam lies below all four steelhead populations, the kelts collected and reconditioned presumably represent a sample of all of the stocks in the basin. For long-term reconditioning, kelts are captured at the Chandler smolt trap between March and June, reconditioned on-site for 6 to 8 months, and released back into the Yakima River at Prosser Dam the following December. Mean weight gain for surviving long-term kelts was approximately 70% over collection weight in 2000-2001, and many fish more than doubled their weight. Collection procedures are identical for short-term reconditioning, but fish are held only 1-2 months and are released below Bonneville Dam. Short-term kelts gain very little weight during their brief reconditioning period, and are expected to recondition naturally in the estuary and/or ocean and eventually return to the Yakima subbasin. Six short-term kelts released below Bonneville Dam in May of 2002 returned in the fall of 2002 and were recaptured in the Denil ladder at Prosser Dam. The mean weight gain of these fish after 5-6 months of natural reconditioning was about 46%.

A total of 867 kelts were captured from 2002 to 2004 and subjected to short-term reconditioning, and 2,147 kelts were collected from 2001 to 2004 and subjected to long-term reconditioning. Kelts are collected throughout the migration period for both programs. Based on Prosser Dam counts for the period July 1, 2000 to March 7, 2005, the grand total of reconditioned kelts represented about 24% of the entire Yakima River population. Program managers anticipate

reconditioning no more than 1,000 to 1,200 kelts per year or, given recent returns, about 25-35 % of the natural run.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 4 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would remain unchanged at 3.3. Average abundance of natural-origin spawners (NOS) would increase from 721 to 729. Harvest contribution of the natural and hatchery populations would increase from 117 to 118.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

There is an experimental kelt (post-spawned steelhead) reconditioning program that may affect steelhead in the Yakima subbasin.

Recommendations

Continue to monitor for spawning success of reconditioned kelts. We have no specific recommendations for this program.

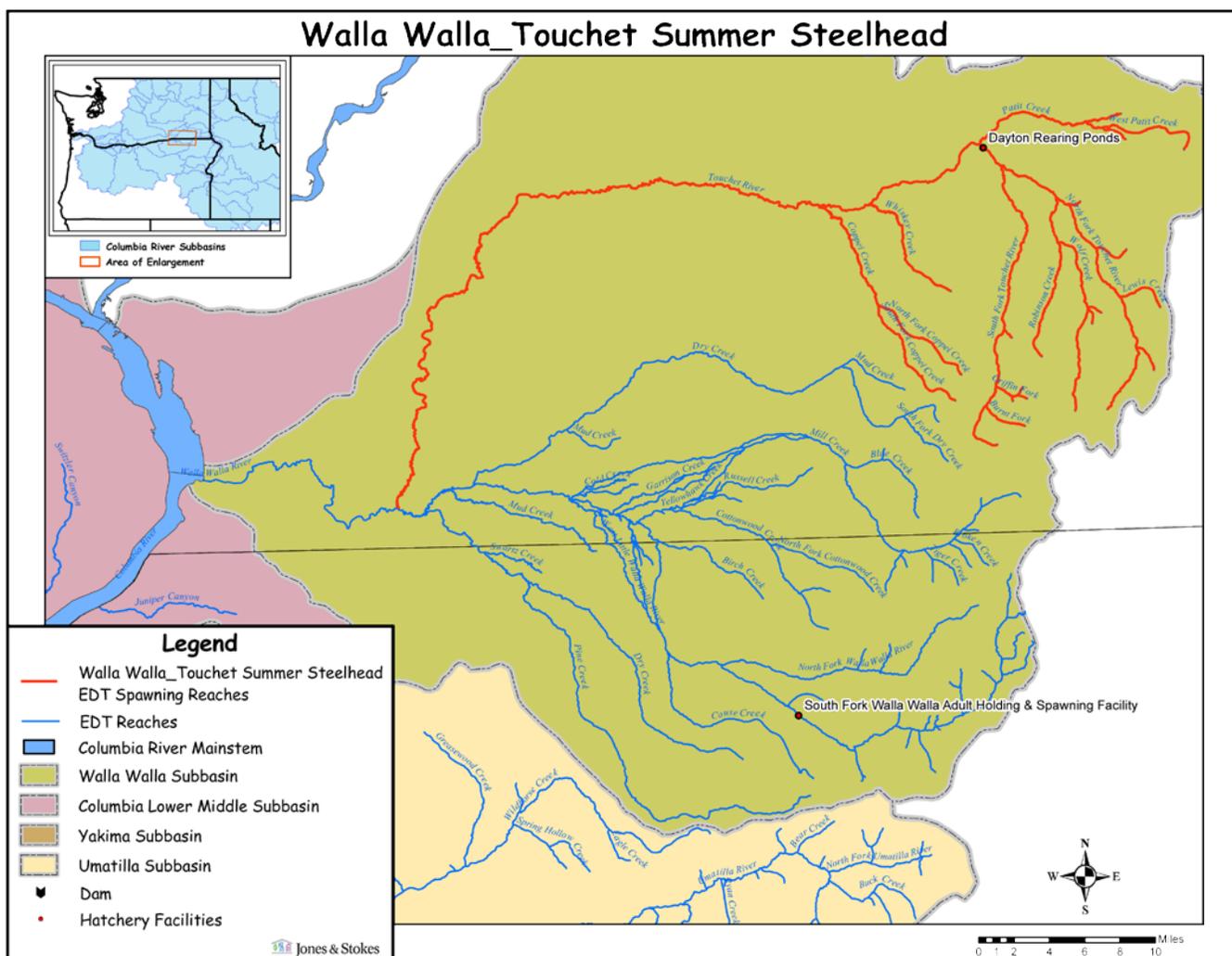
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Yakima Toppenish Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 721 | 3.3 | 117 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 729 | 3.3 | 118 | - |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 728 | 3.3 | 118 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 833 | 3.7 | 135 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Touchet River Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



Note: Spawning reaches likely vary from those depicted.

1 Touchet River Summer Steelhead

The Snake River Salmon Recovery Plan (SRSRP 2007) states that Touchet summer steelhead are an independent population because spawning in the Touchet drainage is distant from spawning areas in the upper Walla Walla (110 km), and because Touchet and Walla Walla fish are genetically distinct (Currens 1997). All spawning occurs in the middle and upper reaches of the Touchet River (above the Coppei Creek confluence), because of high temperatures, high embeddedness/sedimentation and low flows in the lower river. Touchet summer steelhead are part of the mid-Columbia DPS, and part of the Umatilla/WallaWalla MPG. The Touchet population comprises two Major Population Spawning Areas (MaSAs) -- the middle mainstem MaSA (Touchet mainstem and tributaries from Coppei Creek to Patit Creek exclusive of Patit Creek), and the Upper Touchet MaSA (Touchet mainstem and tributaries above Patit Creek). The population also includes one Minor Spawning Area, Patit Creek and tributaries (Oregon Mid-Columbia Recovery Plan 2007).

Spawning occurs in the mainstem Touchet and such tributaries as the North Fork Touchet River, South Fork Touchet River, Wolf Fork Touchet River, Coppei Creek and Patit Creek. A few spawners begin entering the Walla Walla River in June but high temperatures and low flows cause most to enter in the late winter and early spring. Spawning begins in February, peaks in early to mid April and ends in May. Spawners are 60-65% 1-salt and 40-35% 2-salt. The incidence of repeat spawners in the Touchet River is approximately 5%, but about 7% of Walla Walla fish are repeat spawners. Fry emerge May-June, rear in the Touchet drainage above Coppei Creek (near Waitsburg, WA) and smolt primarily as two-year-olds. Some of the highest densities of juvenile *O. mykiss* observed in the Walla Walla Subbasin occur in the forks of the Touchet River, and upper Patit Creek. Outmigration begins in February, peaks in April and ends in June (SRSRP 2007). Rainbow trout are sympatric with Touchet steelhead, and interbreeding does occur (G. Mendel, WDFW, personal communication). Accordingly, rainbow trout are included in the DPS and are considered a “mitigating risk factor” (BRT 2003).

The abundance of the historical Touchet River steelhead population has been estimated at about 1,800 fish and current abundance is estimated at 442 (SRSRP 2007). From 1997 – 2001, natural-origin recruits (NORs) comprised 84% of the return at the Dayton, WA, adult trap, but the proportion of NORs was 91% earlier (1987 – 1996). The hatchery fish observed at the trap are primarily Lyon’s Ferry stock (originally Wells stock) and are not part of the DPS. The hatchery fish intercepted at the Dayton trap are recycled to the lower Touchet for harvest, but some still contribute to the natural spawning escapement because the trap is not fish-tight at high flows.

An incidental terminal harvest rate of 10% has been estimated for Touchet River NORs while the terminal harvest rate on hatchery-origin recruits (HORs) has been estimated at 30% (CBFWA Program Amendment Process 2007).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- **ESA Status:** This population is part of the Mid-Columbia Steelhead Distinct Population Segment and is listed as Threatened under the ESA.

- Population Designation: Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette, this population would be designated as Primary.
- Current Viability Rating: Intermediate
- Recovery Goal for Abundance: 1,000
- Productivity Improvement Expectation: Productivity: 3.12; Capacity: 1,610 (Draft Mid-Columbia Steelhead Recovery Analysis, NOAA 2008)
- Habitat Productivity and Capacity (from EDT): Productivity: 1.7; Capacity: 691

2.2 Current Hatchery Programs Affecting this Population

Two hatchery programs occur within the Touchet River drainage, a segregated harvest program utilizing out-of-DPS stock, and an integrated program using NORs captured at the adult trap at Dayton. The segregated program began in 1983, and between 1983 and 1990 used a variety of stocks -- Wells, Wallowa, Ringold, and Lyons Ferry. Since 1991 only the Lyons Ferry Hatchery stock has been used.

The segregated program releases age-1 smolts at ~4.5 fpp from an acclimation pond in Dayton, WA (RM 54 Touchet River near Patit Creek confluence). Historically, the mean number of fish released per year has been 116,000 (CBFWA Program Amendment Process 2007). In recent years, the mean number released has been 85,000 per year. Releases are volitional between early March until late April, and forced thereafter. All smolts are adipose-clipped and a minimum of 20,000 are ventral clipped as well. In recent years a proportion have also been PIT-tagged. WDFW estimates that about 20% of the returning hatchery adults from the Lyons Ferry program are recovered either at Lyons Ferry Hatchery or in traps in the Walla Walla River. The remaining fish are either harvested or spawn naturally. Biologists attending CBFWA program amendment workshops in 2007 estimated that the about 1,200 Lyons Ferry fish return to the Touchet River each year, of which ~10% spawn naturally. However, most of the hatchery origin spawners in the natural escapement in the upper Touchet (above the trap RM 54) are fish released from the endemic, integrated program. Lyons Ferry adults captured at the Dayton trap have been recycled ~10 miles downstream (to Waitsburg, WA) to augment harvest and limit introgression with the endemic stock, however, they are currently being removed. Differentially marked returns from the endemic program are passed upstream at the Dayton trap.

The endemic program collects ~36 unmarked NORs for broodstock. Between 2000, when the program began, and 2004, an average of 52,982 yearling smolts (range 31,440 – 58,733) have been released *above* the Dayton trap (RM 57.2) without acclimation. Release dates have varied from early April to early May based on stream flow conditions and expected size of fish at release. Although the programmed size at release is 4.5 fpp, the actual size at release has been less, ranging from ~4.9 to ~6.7 fpp. None of the endemic stock smolts are ad-clipped, to reduce harvest losses and facilitate monitoring and evaluating this stock. However, all fish are coded-wire tagged in the snout and a VI tag is placed in the adipose eye tissue for external identification. If the endemic program proves successful, Lyons Ferry releases may be halted and the endemic program expanded.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: 197 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 204 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.3 to 1.6. Average abundance of natural-origin spawners (NOS) would decrease from 345 to 243 fish. Harvest contribution of the natural and hatchery populations would go from 1,396 to 25.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The WDFW operates both an integrated conservation and segregated harvest program within the Touchet subbasin. Releases for the segregated program are imported annually from Lyons Ferry Hatchery (85,000 smolts acclimated at the Dayton Pond). Smolt releases from the segregated program occur below primary rearing and spawning reaches of the Touchet River.

The existing integrated program (50,000 smolts with a 100% pNOB are hauled and planted directly from Lyons Ferry Hatchery) is operated consistent with the criteria for a Primary population; however, strays from the segregated harvest program constitute more than 10% of the effective natural spawners (basin-wide) and likely pose an ecological and genetic risk to the population. This is not consistent with the standards for a Primary population. An adult trap is located within the City of Dayton; however, it has limited potential for controlling hatchery fish since adult steelhead can pass without entering the trap. A new facility has been constructed and its capabilities are unknown. Comments on smolt quality (size, size variation, degree of Smoltification) by managers indicate it may be affecting SAR of the integrated conservation program. Adults from both Lyons Ferry hatchery and the endemic stock also appear above Lower Granite Dam.

Low natural productivity in the Touchet limits abundance and management options for the population.

Recommendations

The HSRG solution transitions the broodstock collection of Lyons Ferry Hatchery stock to sites within the Walla Walla and Touchet in place of current broodstock collection at Lyons Ferry Hatchery to aid in local adaptation. The solution maintains the current release numbers in the Walla Walla but reduces them in the Touchet River. In addition to the integrated program (49,000 smolts), a segregated program of approximately 20,000 smolts could be operated consistent with the designation of a Primary population if 90% of the returning unharvested adults were removed. Smolts from the integrated program should be acclimated in areas of their intended return.

A single integrated program of approximately 70,000 smolts could be managed consistent with a Primary population designation. Expanding the program beyond this level would require habitat enhancements to improve productivity and the development of facilities to trap and control adults on the spawning ground.

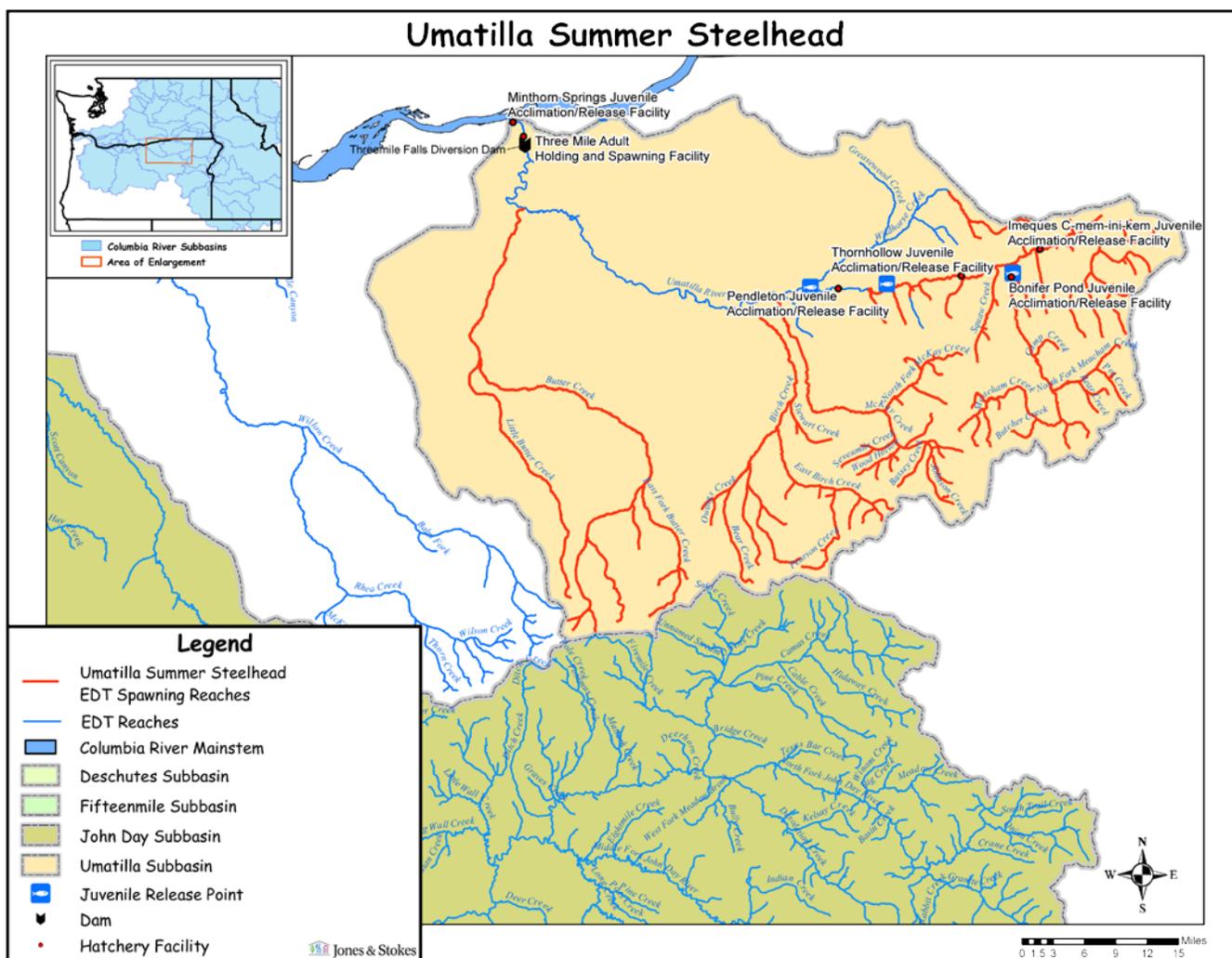
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Touchet River Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 49.2 | 0% | 0% | 43% | 0.70 | 345 | 1.3 | 60 | 0 |
| | Seg Harv | 84.4 | 26% | | | | | | 1,336 | 126 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 243 | 1.6 | 25 | - |
| HSRG Solution | Int Cons | 49.2 | 35% | 0% | 49% | 0.67 | 343 | 1.3 | 104 | 221 |
| | Seg Harv | 21.1 | 90% | | | | | | 334 | 109 |
| HSRG Solution w/ Improved Habitat | Int Cons | 49.2 | 35% | 0% | 46% | 0.69 | 398 | 1.4 | 110 | 221 |
| | Seg Harv | 21.1 | 90% | | | | | | 334 | 109 |

Hatchery Scientific Review Group Review and Recommendations

Umatilla Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Umatilla Summer Steelhead

The Umatilla/Willow subbasin is a 3,714 square mile area in northeastern Oregon located primarily in Umatilla and Morrow counties, with a small portion extending into Union County. The Umatilla/Willow subbasin is composed of four drainages: the Umatilla subbasin, the Willow Creek subbasin, the Six-Mile Canyon drainage, and the Juniper Canyon drainage. The mainstem Umatilla River is 89 miles long and the river and its tributaries drain an area of nearly 2,290 square miles. Willow Creek is 79 miles long and drains an area of about 880 square miles. The Six-Mile Canyon area, which contains intermittent streams that rarely drain into the Columbia River, is 472 square miles. The mainstem of Juniper Canyon Creek is 19 miles long and drains 72 square miles (Umatilla Subbasin Plan 2004).

Adult returns to the Umatilla are recorded as fish pass Three Mile Dam located at RM 4 on the mainstem Umatilla River. Returns of naturally-produced summer steelhead averaged 1,663 between 1988 and 2003 with a high of 3,562 in 2002 and a low of 724 in 1991. Hatchery returns to Three Mile Dam between 1988 and 2003 averaged 2,412 adults with a high of 5,520 in 2002 and a low of 1,111 in 1991 (Umatilla Subbasin Plan 2004).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Naturally spawning summer steelhead in the Umatilla system are included in the Middle Columbia River Summer Steelhead DPS which was listed as Threatened under the ESA in 1999. This status was reaffirmed in 2006.
- **Population Designation:** Using a rating system similar to that used by the recovery planners for the lower Columbia and Willamette arrives at a designation of Contributing.
- **Current Viability Rating:** Unknown
- **Recovery Goal for Abundance:** Unknown
- **NOAA Fisheries Interim Abundance Target:** 4,000
- **Productivity Improvement Expectation:** Unknown
- **Habitat Productivity and Capacity (from EDT):** Productivity: 1.91, Capacity: 4,230

2.2 Current Hatchery Programs Affecting this Population

An integrated harvest program currently operates in the basin, collecting broodstock at Three Mile Dam for production and release of Stock 091 summer steelhead. Broodstock are selected at random from adults entering the east bank ladder trap at Three Mile Dam. Broodstock are anesthetized using CO₂ and are transported for spawning to the Minthorn Springs facility located on Minthorn Springs Creek at ~ RM 64 on the Umatilla River. Ripe fish are spawned from early April to late May with one male being paired with one female. Pairing always uses wild x wild or wild x hatchery to reduce potential negative effects of hatchery x hatchery domestication. Only 17% of spawned broodstock are Umatilla Hatchery-origin fish, as identified by fin clips and coded-wire tags. Fertilized eggs are transported in five gallon buckets to the Umatilla Hatchery

on the Columbia River approximately 11 miles downstream of the Umatilla/Columbia confluence. Here they are reared on Columbia River water until ready for transport to acclimation sites in the Umatilla River. Juveniles are moved to Pendleton and Minthorn acclimation sites in late March for a 4-week acclimation. Bonifer Acclimation site is also used but there have been problems getting all of the juveniles out of the ponds so recently this facility has been used only as a release site. About 50,000 juveniles are released at ~5.1 fpp (1992-2002 average) at Pendleton, Minthorn, and Bonifer for a total release of 150,000 juveniles in late April. Forty percent of each release group is coded-wire tagged and 100% are adipose clipped.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated hatchery program: 723 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 157 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase slightly from 1.6 to 1.8. Average abundance of natural-origin spawners (NOS) would decrease from approximately 2,034 fish to approximately 1,832 fish. Harvest contribution of the natural and hatchery populations would go from approximately 439 fish to approximately 142 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager’s goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The current 150,000 summer steelhead integrated smolt program is consistent with the guidelines for a primary population. Since inception, this program has used natural origin adults for broodstock.

Given that hatchery fish make up about 30% of the escapement, there appears to be hatchery fish available for additional harvest.

Recommendations

The HSRG has no specific recommendations to improve upon this program.

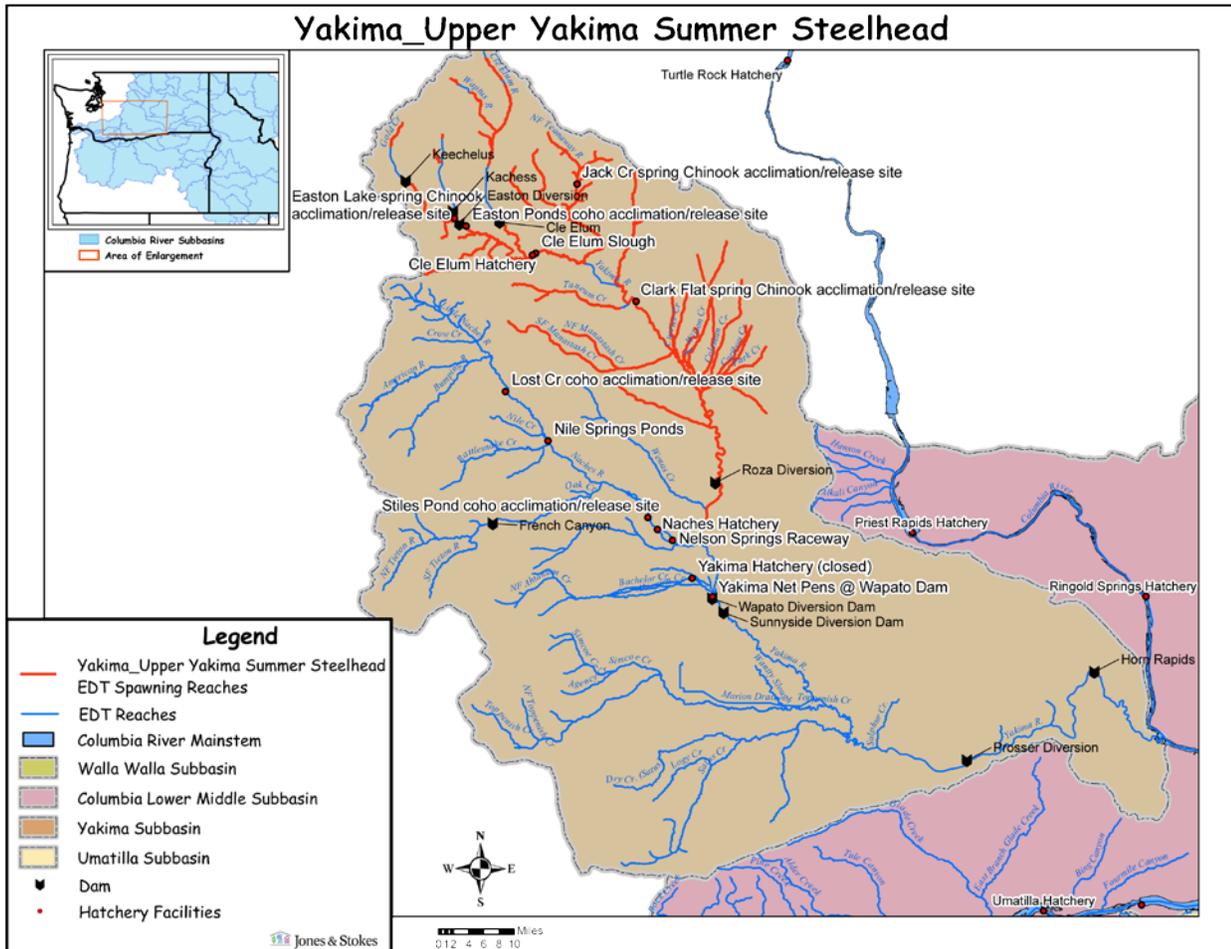
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Umatilla Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 149.9 | 1% | 0% | 24% | 0.80 | 2,034 | 1.6 | 439 | 4 |
| | | | | | | | | | 0 | 0 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,832 | 1.8 | 142 | - |
| HSRG Solution | Int Harv | 149.9 | 1% | 0% | 24% | 0.80 | 2,011 | 1.6 | 437 | 4 |
| | | | | | | | | | 0 | 0 |
| HSRG Solution w/ Improved Habitat | Int Harv | 149.9 | 1% | 0% | 21% | 0.82 | 2,407 | 1.8 | 468 | 4 |
| | | | | | | | | | 0 | 0 |

Hatchery Scientific Review Group Review and Recommendations

Upper Yakima Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Upper Yakima Summer Steelhead

The Yakima Subbasin supports four genetically and demographically distinct stocks of summer steelhead, the Satus Creek stock, the Toppenish Creek stock, the Naches River stock and the upper Yakima stock. Hockersmith et al (1995) successfully monitored 105 radio tagged steelhead to spawning over brood years 1990 through 1992. Because high flow and turbidity in the Naches River and Yakima mainstem precludes visual redd counts during steelhead spawning, this radio tagging data has been the only means of determining the overall stock composition of the run. Over all three years, the mean percent of radio-tagged fish that spawned in Satus Creek, the Naches River watershed, Toppenish Creek, and the upper Yakima was 48.0%, 31.6%, 13.3% and 7.1%, respectively.

Estimates of the size of the historical steelhead run range from 20,800 (Kreeger and McNeil 1993) to 100,000 (Smoker 1956). Although the upper Yakima population now represents only about 7% of Yakima subbasin steelhead production, it is likely that historically it was the dominant producer. This is because it is much larger than any of the other watersheds (~75% of the wetted area of the subbasin occurs in the upper Yakima watershed) and because it contains many moderate gradient tributaries suitable for steelhead spawning and rearing. Several factors have reduced production in the upper Yakima River. These include early damming of spawning tributaries favored by steelhead; closing the fish ladder at Roza Dam during much of the steelhead spawning run (mid-October to mid-March) from 1941 through 1959¹; and the presence of four large diversion dams downstream of Roza Dam, each imposing a significant mortality (20% at Prosser Dam alone) on bypassed smolts. All of these factors reduce the productivity of anadromous *O. mykiss* more than resident life history types, and impose a selective pressure in favor of the resident life history type (Yakima Subbasin Summary). These factors and perhaps others have combined to produce an upper Yakima *O. mykiss* population that is genetically homogenous (Busack and Phelps 1991), abundant and overwhelmingly resident. Available data on juvenile *O. mykiss* densities in upper Yakima tributaries and the mainstem indicate that the number of adult resident *O. mykiss* is at least 15,000 (Watson 2008). By contrast, the number of adult steelhead counted at the Roza Dam fish ladder between 1990 and 2007 ranged from 14 to 238 with a mean of 92. Like all populations of Yakima steelhead, the upper Yakima population has grown somewhat since 2000. The mean abundance of upper Yakima steelhead from 1990 (the first year of complete Roza Dam counts) through 2000 was 47; mean abundance from 2001 through 2007 was 161.

Many hatchery *O. mykiss* have been released in the Yakima subbasin. Three million hatchery trout (primarily South Tacoma and Goldendale stock) were planted in the upper Yakima and Naches rivers between 1950 and 1987, and 1.6 million hatchery steelhead (primarily Skamania stock) were planted in these same systems between 1961 and 1987. After 1987, no out-of-basin hatchery steelhead were released in the Yakima subbasin, although experimental releases (40,000 – 100,000) of hatchery-reared Yakima stock steelhead were made between 1987 and 1994. The 1991 – 1994 releases occurred in the North Fork Teanaway River, an upper Yakima tributary. Between 1995 and 1999, no hatchery steelhead programs of any kind operated in the Yakima subbasin. A kelt reconditioning program at Prosser Hatchery on the lower Yakima River (RM 47) began on a test basis in 1999 and moved into full production in 2001. This is the only steelhead artificial production program currently in operation in the Yakima subbasin (see below).

¹ Unfettered, year-round adult passage was not restored to the upper Yakima until 1989 when a ladder was retrofitted.

Although the entire Yakima subbasin was closed to steelhead fishing in 1994, considerable illegal and/or inadvertent steelhead harvest is believed to occur during the winter whitefish fishery, especially in steelhead staging areas off the mouths of Satus and Toppenish creeks. A terminal harvest rate of 8 percent has been estimated (C. Frederickson, Yakama Nation, personal communication 2007).

Summer steelhead spawn in most of the accessible tributaries in the upper Yakima, but especially in the Teanaway River and its tributaries, Taneum Creek, Swauk Creek and Umtanum Creek. Spawning also occurs in the mainstem, especially in side channels with abundant cover. Spawning occurs over a fairly wide period, given the range of elevations and seasonal water temperatures in the watershed. At the lowest elevations, spawning can begin as early as March, while at the highest elevations, spawning can continue into June (Yakima Subbasin Plan).

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Native upper Yakima summer steelhead are part of the Middle Columbia Steelhead DPS, which were listed as a threatened species on March 25, 1999.
- Population Designation: Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette arrives at a designation of Contributing.
- Current Viability Rating: High risk of extinction (Yakima Subbasin Salmon Recovery Plan)
- Recovery Goal for Abundance: 2,000
- Productivity Improvement Expectation: 1.75 (C. Frederickson, Yakama Nation, personal communication).
- Habitat Productivity and Capacity (from EDT): Productivity: 1.32; Capacity: 1,750

2.2 Current Hatchery Programs Affecting this Population

The Prosser Hatchery kelt reconditioning program is the only steelhead artificial production program in the basin. The Yakima Basin Steelhead Reconditioning Project HGMP (2005) summarized the program as follows. Steelhead kelts are collected at the Chandler smolt trap at Prosser Dam (RM 47) and subjected to short- and long-term reconditioning and release. Because Prosser Dam lies below all four steelhead populations, the kelts collected and reconditioned presumably represent a sample of all of the stocks in the basin. Under long-term reconditioning, kelts are captured at the Chandler smolt trap between March and June, reconditioned on-site for 6 to 8 months, and released back into the Yakima River at Prosser Dam the following December. Mean weight gain for surviving long-term kelts was approximately 70% over collection weight in 2000-2001, and many fish more than doubled their weight. Collection procedures are identical for short-term reconditioning, but fish are held only 1-2 months and are released below Bonneville Dam. Short-term kelts gain very little weight during their brief reconditioning period, and are expected to recondition naturally in the estuary and/or ocean and eventually return to the Yakima subbasin. Six short-term kelts released below Bonneville Dam in May of 2002 returned in the fall of 2002 and were recaptured in the Denil ladder at Prosser Dam. The mean weight gain of these fish after 5-6 months of natural reconditioning was about 46%.

A total of 867 steelhead kelts were captured from 2002 to 2004 and subjected to short-term reconditioning, and 2,147 kelts were collected from 2001 to 2004 and subjected to long-term reconditioning. Kelts are collected throughout the migration period for both the short and long-term programs. Based on Prosser Dam counts from July 1, 2000 to March 7, 2005, reconditioned kelts represented about 24% of the entire Yakima River population. Program managers anticipate reconditioning no more than 1,000 to 1,200 kelts per year or, given recent returns, about 25-35 % of the natural run.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 4 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.1. Average abundance of natural-origin spawners (NOS) would increase from 11 to 175. Harvest contribution of the natural and hatchery populations would increase from two to 28 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager’s goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Steelhead productivity in the upper Yakima is limited by adult access to tributaries, poor juvenile passage at Roza Dam, and competition between resident and anadromous *O. mykiss*. The low productivity creates a situation where upper Yakima steelhead are sensitive to hatchery strays and their effect on fitness. Hence, the long-term projection of population productivity and abundance under current conditions is due to loss of fitness from effects of hatchery strays. Population productivity and abundance absent hatchery effects are more indicative of current population abundance.

There is an experimental kelt (post-spawned steelhead) reconditioning program that may affect steelhead in the Yakima subbasin.

Recommendations

Continue to monitor for spawning success of reconditioned kelts. We have no other specific recommendations for this program.

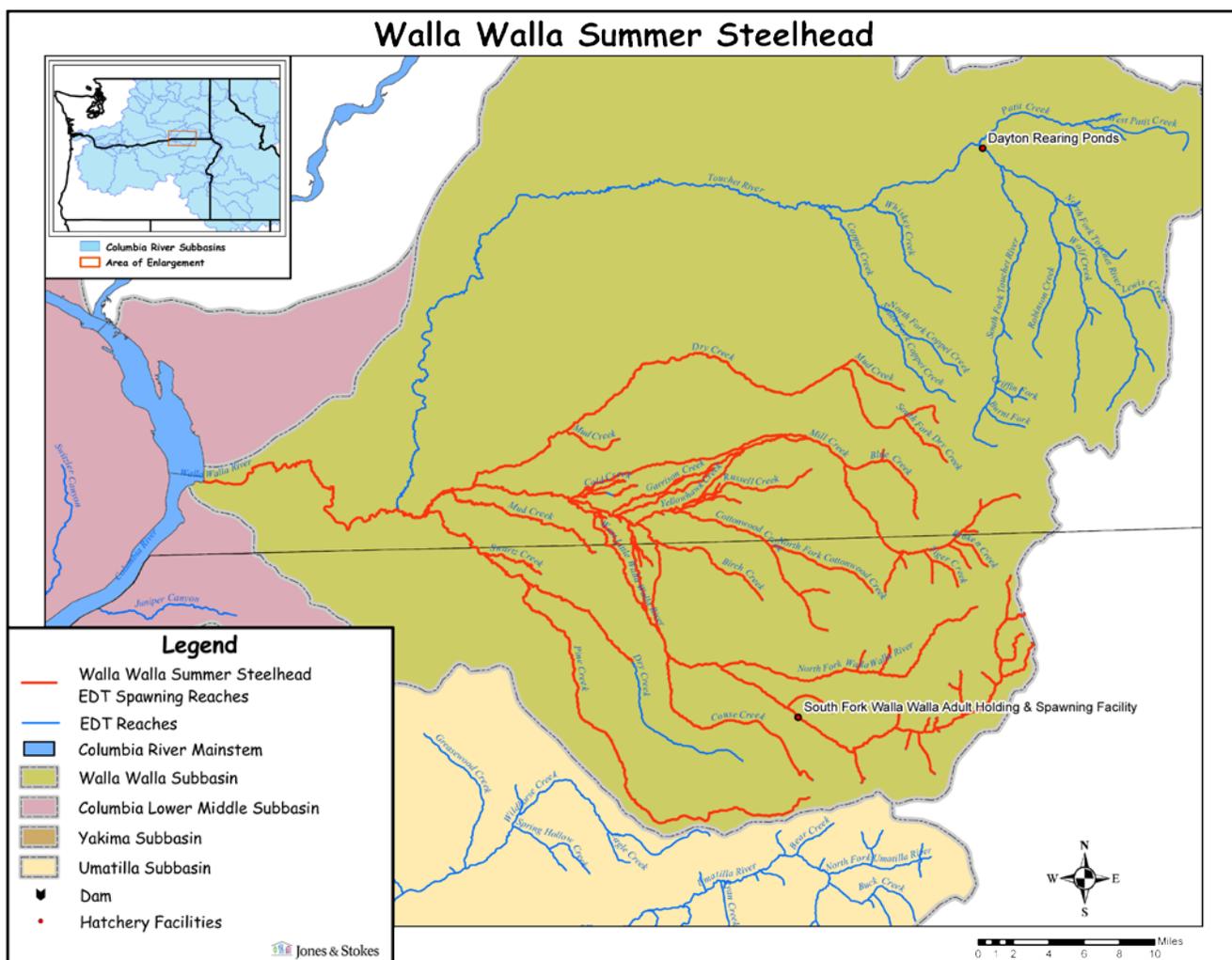
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Upper Yakima Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | 0.0 | 0% | 0% | 23% | 0.00 | 11 | 0.6 | 2 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | 0.0 | 0% | 0% | 0% | 0.00 | 175 | 1.1 | 28 | - |
| HSRG Solution | None None | 0.0 | 0% | 0% | 0% | 0.00 | 151 | 1.1 | 24 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | 0.0 | 0% | 0% | 0% | 0.00 | 331 | 1.2 | 54 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Walla Walla River Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



Note: Spawning reaches likely vary from those depicted.

1 Walla Walla River Summer Steelhead

The Snake River Salmon Recovery Plan (SRSRP 2007) states that Walla Walla summer steelhead are an independent population distinct from the Touchet River (a Walla Walla tributary) population because spawning in the Touchet drainage is distant from spawning areas in the upper Walla Walla (110 km), and because Touchet and Walla Walla fish are genetically distinct (Currens 1997). No spawning by natural origin recruits (NORs) occurs in the Walla Walla mainstem from the mouth to the Dry Creek confluence because of high water temperatures, high embeddedness/sedimentation and low flows. Walla Walla summer steelhead are part of the mid-Columbia DPS, and part of the Umatilla/WallaWalla MPG. The Walla Walla population comprises two Major Population Spawning Areas (MaSAs) -- the Walla Walla MaSA (the mainstem, forks and tributaries exclusive of the Touchet River and Mill Creek), and the Mill Creek MaSA (Mill Creek and tributaries from mouth to headwaters). The population also includes two Minor Spawning Areas (MiSAs), Dry Creek (Dixie) from mouth to headwaters and Pine-Dry Creek from mouth to headwaters (Oregon Mid-Columbia Recovery Plan 2007).

The Interior Columbia Technical Recovery Team (ICTRT classified) the Walla Walla River population as an “Intermediate” sized population. A steelhead population classified as Intermediate has a mean minimum viability abundance threshold of 1,000 natural spawners with a sufficient intrinsic productivity (greater than 1.4 recruits per spawner at the threshold abundance level) to achieve a 5% or less risk of extinction over a 100-year timeframe.

Although substantially reduced from historical times, spawning is widely distributed within the North and South Forks and the upper mainstem of the Walla Walla River, Couse Creek, middle and upper Mill Creek, and upper Dry Creek (Recovery Plan for Oregon’s Middle Columbia River Steelhead 2006). During the cooler months, juveniles are found throughout the mainstem, but in the summer the distribution is limited to reaches above the Mill Creek confluence (RM 37) due to high temperatures and poor habitat conditions. Within the Washington portion of the watershed, Mill Creek (upstream of Bennington Dam above RM 16.7), Blue Creek (approximately RM 0 to 1.6), and Dry Creek’s tributaries (North Fork Dry Creek, and South Fork Dry Creek) have the highest densities of age 1+ and older steelhead. The lowest densities occur in the west Little Walla Walla Drainage, which periodically dewater, in the mainstem Walla Walla between its confluences with Dry and Mill creeks, and in Mill Creek from Gose Street to Bennington Dam (RM 5.4 to 11.4) (SRSRP 2007).

A few spawners begin entering the Walla Walla River in June but high temperatures and low flows cause most to enter in the late winter and early spring. Spawning begins in February, peaks in early to mid April and ends in May. Like Touchet River spawners, Walla Walla spawners are 60-65% 1-salt and 40-35% 2-salt. The incidence of repeat spawners in the Walla Walla population has been estimated at about 7%. Fry emerge May-June, rear mostly in the Walla Walla drainage above Mill Creek and smolt primarily as two-year-olds. Outmigration begins in February, peaks in April and ends in June (SRSRP 2007). Rainbow trout are sympatric with Walla Walla steelhead, and interbreeding does occur (G. Mendel, WDFW, personal communication). Accordingly, rainbow trout are included in the DPS and are considered a “mitigating risk factor” (BRT 2003).

The abundance of the historical Walla Walla River steelhead population has been estimated at about 2,700 fish. Mean abundance at the present time is estimated at 541, of which 441 occur above Nursery Bridge in Oregon in the upper mainstem and forks. In recent years natural-origin recruits (NORs) have comprised 96% of the at the Nursery Bridge trap in Milton-Freewater, OR.

The hatchery fish observed at the trap are primarily Lyon's Ferry stock (originally Wells stock) and are not part of the DPS.

At a CBFWA Program Amendment workshop in 2007, it was estimated that only about 2% of the hatchery steelhead entering the mouth of the Walla Walla River actually spawn with Walla Walla NORs because Lyon's Ferry fish spawn about a month earlier than natural fish, and because of an assumed 80% relative spawning effectiveness for Lyon's Ferry Hatchery steelhead.

An incidental terminal harvest rate of 3% has been estimated for Walla Walla River NORs while the terminal harvest rate on hatchery-origin recruits (HORs) has been estimated at 30% (CBFWA Program Amendment Process 2007).

Mill Creek is a major tributary to the Walla Walla River. Although steelhead abundance in Mill Creek has not been accurately estimated, local biologists are concerned that the steelhead population may be very low because of poor passage conditions in the radically channelized portion of the Mill Creek that flows through the city of Walla Walla. However, in 2004, video monitoring revealed that some passage was occurring at the Bennington Dam ladder which has recently been upgraded (G. Mendel, WDFW, personal communication, July 2004). Passage into and within the system is limited by low instream flows, warm water temperatures, and physical impediments both in the flood control channel in the city of Walla Walla and at the Bennington Lake diversion and ladder structure some miles upstream (SRSRP 2007).

The Oregon mid-Columbia Steelhead Recovery Plan (2007) found that the Walla Walla steelhead population did not meet the recommended criteria for viability. In terms of abundance and productivity, the Walla Walla population was judged to be a moderate risk because the point estimate of current productivity and abundance fell between the 5% and 25% isopleths on the Viability Curve. The plan also considered the population to be at moderate risk in terms of spatial structure and diversity: a significant reduction in spawner distribution has resulted in increased gaps and loss of continuity within the population, as well as between the Walla Walla population and other mid-Columbia populations. Furthermore, increased water temperatures, hydrograph changes and obstructions have likely resulted in selective mortality at multiple life stages, reducing genotypic and phenotypic diversity.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: This population is part of the Mid-Columbia Steelhead Distinct Population Segment and is listed as Threatened.
- Population Designation: Using a rating system similar to that used by the recovery planners for the Lower Columbia and Willamette, this population would be considered Primary.
- Current Viability Rating: Intermediate
- Recovery Goal for Abundance: 1,000 spawners with a 1.35 R/S at the threshold abundance.
- Productivity Improvement Expectation: Productivity: 3.11; Capacity: 2,878 (Draft Mid-Columbia Steelhead Recovery Plan, ODFW 2007)
- Habitat Productivity and Capacity (from EDT): Productivity: 1.84; Capacity: 2,180

2.2 Current Hatchery Programs Affecting this Population

The only hatchery program targeting the Walla Walla population is a segregated harvest program. This program began 1983, and used Wells, Wallowa, Ringold, and Lyons Ferry brood stock from 1983 - 1990. Since 1991, however, only the Lyons Ferry Hatchery stock has been used.

The segregated program releases age-1 smolts at ~4.5 fpp from a point below the Mill Creek confluence (~RM 35) in mid April (April 15 – 25). The fish are not acclimated before release because earlier studies indicated hatchery return rates were higher for direct releases than acclimated releases, presumably because of very poor water quality in the lower river. In recent years, the mean number of fish released per year has been 137,339 (CBFWA Program Amendment Process 2007). In recent years, releases have been reduced to 100,000. All smolts are adipose-clipped and a minimum of 20,000 are ventral clipped as well. In addition, a proportion is also PIT-tagged. WDFW estimates that about 20% of the returning hatchery adults from the Lyons Ferry program are recovered either at Lyons Ferry Hatchery or in traps in the Walla Walla Subbasin. The remaining fish are either harvested or spawn naturally. Biologists attending CBFWA program amendment workshops in 2007 estimated that an average of 1,336 Lyons Ferry fish return to the mouth of the Walla Walla River, but that no more than 2% of these fish (~26 adults) reached the natural spawning areas above Nursery Bridge or in Mill Creek. As mentioned, terminal harvest rates on HORs are estimated at 30%, while a 3% incidental harvest is assumed for NORs.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 65 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects. Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.9 to 1.7. Average abundance of natural-origin spawners (NOS) would decrease from 245 to 859. Harvest contribution of the natural and hatchery populations would decline from 1,582 to 89.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Lyons Ferry Hatchery (LFH) and Tucannon Fish Hatchery (TFH) were built/modified under the Lower Snake River Fish and Wildlife Compensation Plan to compensate for the annual loss of summer steelhead caused by hydroelectric projects on the Snake River.

The Lyons Ferry hatchery Complex currently uses four summer steelhead stocks to produce smolts for release into the Snake (60,000 smolts of LFH stock), Tucannon (100,000 smolts of LFH stock, 50,000 smolts of Tucannon Endemic stock), Grande Ronde (160,000 smolts of Wallowa stock), Walla Walla (100,000 smolts of LFH stock), and Touchet rivers (85,000 smolts of LFH stock, 50,000 smolts of Touchet Endemic stock) to enhance recreational opportunities for steelhead anglers and for recovery purposes. All steelhead smolts for the program are planned for a release size of 4.5 fish/lb (about 100 g/fish). Current releases of summer steelhead smolts are lower than originally specified by the LSRCF program. Releases have periodically been reduced through the years (in 2001 the LFH and Wallowa stock programs were reduced by 37%) in partial response to Endangered Species Act (ESA) concerns and documented smolt-to-adult (SAR) survival rates far exceeding the original SAR goal of 0.5% (USACE 1975). (Lyons Ferry Complex Hatchery Evaluation: Summer Steelhead Annual Report 2005 Run Year June 2007)

The Walla Walla summer steelhead population is included in the middle Columbia River Distinct Population Segment (DPS) and is listed as threatened under the ESA. Recovery objectives for the population have not been defined, but the population appears to meet the standards for a primary designation. The steelhead management objectives for the basin include both conservation and harvest.

The majority of the currently productive habitat is located in the upper watershed above Nursery Bridge in the town of Milton Freewater and is managed as a wild fish sanctuary. The lower watershed is managed as a terminal fishing area, but does include some potential steelhead habitat in Mill Creek and Walla Walla River just below Nursery Bridge. A trap is operated at Nursery Bridge to monitor the population returning to the upper watershed.

Approximately 100,000 smolts released into the lower watershed are imported annually from Lyons Ferry Hatchery and are planted directly into the Walla Walla River without acclimation. Hatchery adults escaping the fishery spawn in the lower river where their ecological and genetic effects on the population as a whole are unknown. The contribution of hatchery fish to natural spawning in the wild fish sanctuary is reported to be very low.

Recommendations

Eliminate the annual importation and release of out-of-basin fish and develop within-basin adult collection to promote a locally adapted hatchery broodstock. A segregated, integrated, or some combination of the two types of programs could be developed consistent with a primary population designation. Under any scenario, facilities to acclimate and release juveniles and recapture returning adults will need to be developed.

Under an integrated option, broodstock would be derived from the native stock. An integrated program (using native broodstock) of the current size (100,000 smolts) could be sustained if 20% of the returning hatchery fish are removed and if 50% (about 30 fish) natural origin broodstock can be collected (assumes a 50:50 sex ratio). Alternatively, if 80% of the returning hatchery fish were removed, only 20% natural-origin broodstock (about 12 fish) would need to be obtained to sustain the same size program.

The HSRG solution transitions the broodstock collection of Lyons Ferry Hatchery stock to sites within the Walla Walla in place of current broodstock collection at Lyons Ferry Hatchery to aid in local adaptation. The solution maintains the current release numbers in the Walla Walla. Because the program uses up to 100 breeders annually under this segregated option (for the 100,000 smolt release), a local broodstock with a sufficiently high effective population size should be developed from fish returning to the Walla Walla. The adult collection and acclimation facility should be sited to better segregate hatchery fish from steelhead habitat below Nursery Bridge. A program of the current size could be sustained if 90% of the returning fish escaping the fishery are removed.

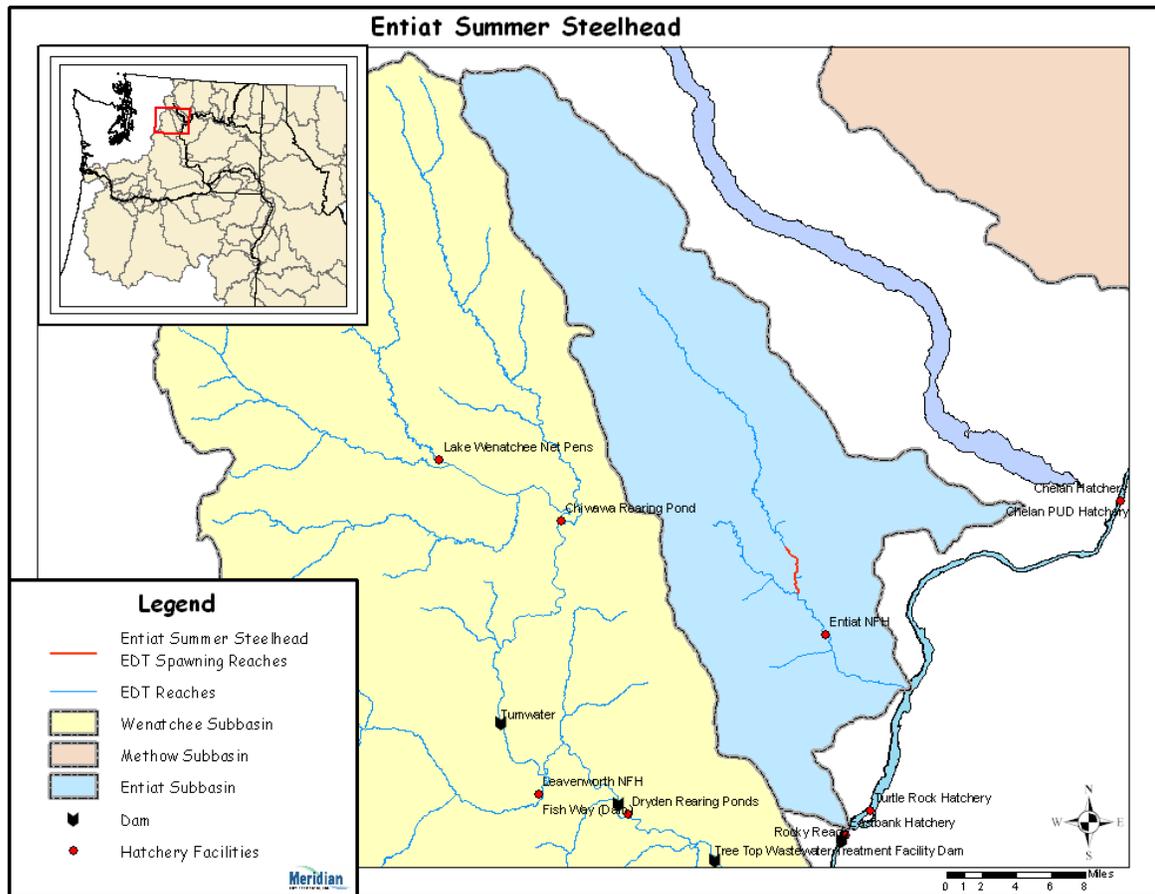
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Walla Walla Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 12% | 0.00 | 245 | 0.9 | 25 | 0 |
| | Seg Harv | 100.2 | 23% | | | | | | 1,557 | 117 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 859 | 1.7 | 89 | - |
| HSRG Solution | None None | - | 0% | 0% | 6% | 0.00 | 314 | 1.1 | 33 | 0 |
| | Seg Harv | 100.2 | 90% | | | | | | 1,557 | 362 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 2% | 0.00 | 750 | 1.5 | 78 | 0 |
| | Seg Harv | 100.2 | 90% | | | | | | 1,557 | 362 |

Hatchery Scientific Review Group Review and Recommendations

Entiat Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Entiat River Summer Steelhead

Entiat River summer steelhead are considered part of the Upper Columbia River Steelhead DPS. This DPS includes all naturally-spawned anadromous steelhead populations below natural and man-made impassable barriers in streams of the Columbia River Basin upstream of the Yakima River to the U.S.-Canada border. Courts confirmed the endangered status of the DPS in June 2007. The Entiat River population is considered a “Basic” population by the Interior Columbia Technical Review Team (ICTRT). A “Basic” steelhead population is one that must have a minimum abundance of 500 spawners and a S/S ratio of 1.3 to be viable.

Historical summer steelhead abundance in the Entiat River has been estimated at approximately 500 fish. They were thought to have spawned in the mainstem Entiat River and Mad River. Spawning may also have occurred in the lower portions of the Mud, Potato, Stormy, Tillicum and Roaring Creeks (UCSRB 2007).

2 Current Conditions

The UCSRB (2007) describes the life history of this population as follows:

Adults return to the Columbia River in the late summer and early fall. Unlike spring Chinook, most steelhead do not move upstream quickly to tributary spawning streams. A portion of the returning run overwinters in the mainstem reservoirs, passing over the Upper Columbia River dams in April and May of the following year. Spawning occurs in late spring of the calendar year following entry into the river. Currently, and for the past 20+ years, most steelhead spawning in the wild are hatchery fish. The effectiveness of hatchery fish spawning in the wild compared to naturally produced spawners is unknown at this time and may be a major factor in reducing steelhead productivity.

Juvenile steelhead rear from 1-3 years in freshwater. Steelhead adults spend 1-2 years in the ocean before returning to the Columbia River. Adult fecundity averages from 5,300 to 6,000 eggs per female.

Between 1967 and 2002, adult escapement to the Entiat River ranged from 9 to 366 fish. The running 12-year geometric mean ranged from 24 to 118 adults over this same period. At the time of listing (1997), the 12-year geometric mean for adult abundance and productivity was 101 and 0.25, respectively.

Steelhead spawn in the Entiat River from RM 0.5 to RM 28. In the Mad River, steelhead can be found spawning from RM 1.3 to 7.2. Summer steelhead have been found in Lower Tillicum, Roaring, and Stormy Creeks (UCSRB 2007).

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Endangered
- Population Description: The Entiat River population is considered a “Basic” population by the ICTRT. A “Basic” steelhead population is one that must have a minimum abundance of 500 spawners and a S/S ratio of 1.3 to be viable. The HSRG has classified this population as Primary.
- Recovery Goal for Abundance: 500 adults

- **Productivity Improvement Expectation:** The Upper Columbia River recovery plan sets a 12-year geometric mean abundance and productivity target at 500 and 1.2 (S/S), respectively
- **Habitat Productivity and Capacity:** Productivity: 0.9; Capacity: 170

2.2 Current Hatchery Programs Affecting this Population

No hatchery summer steelhead are released in this subbasin.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 642 fish

Hatchery strays are assumed to originate from the Methow, Wenatchee and Okanogan summer steelhead programs.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.4 to 1.0. Average abundance of natural-origin spawners (NOS) would decrease from approximately 84 fish to approximately 4 fish.

Harvest contribution of the natural and hatchery populations would go from approximately 8 fish to approximately 0 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with managers' goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified Entiat summer steelhead as an important population. For the purposes of this analysis, the HSRG assumed this population should be considered a Primary population. As currently managed, it is not consistent with that designation, having a pHOS greater than 5%.

Hatchery strays from Wells Hatchery and Wenatchee hatchery stocks spawn naturally in the Entiat system; however, given the current habitat capacity and productivity provided to the HSRG, this population does not appear to be sustainable under current conditions. In the absence of hatchery strays, this population may disappear.

Recommendations

In order for this population to contribute to recovery, it will require improvements to habitat productivity. Until habitat productivity improves, there is little managers can do to improve the condition of this population.

Managers should consider a safety net conservation program, including a kelt reconditioning program from natural-origin fish returning to the Entiat.

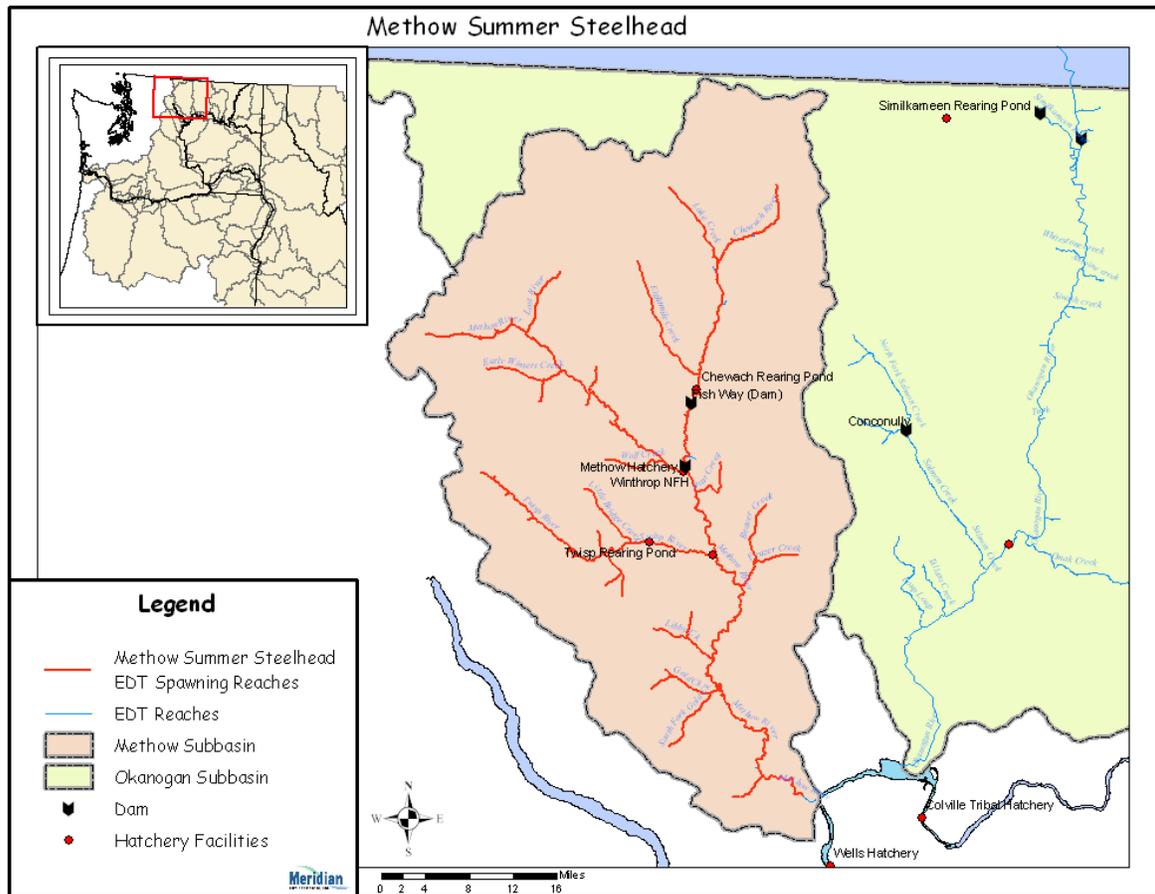
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Entiat Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 86% | 0.00 | 84 | 0.4 | 8 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 4 | 1.0 | 0 | - |
| HSRG Solution | None None | - | 0% | 0% | 63% | 0.00 | 51 | 0.5 | 5 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 60% | 0.00 | 58 | 0.6 | 6 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Methow Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Methow River Summer Steelhead

Methow River summer steelhead are considered part of the Upper Columbia River Steelhead DPS. This DPS includes all naturally-spawned anadromous steelhead populations below natural and man-made impassable barriers in the Columbia River Basin upstream of the Yakima River to the U.S.-Canada border. Since June 2007, the DPS has been listed as endangered under the ESA. The Methow River population is considered an “Intermediate” population by the ICTRT. An “Intermediate” steelhead population is one that must have a minimum abundance of 1,000 spawners and a S/S ratio of 1.1 to be viable

Historical summer steelhead abundance in the Methow River has been estimated at approximately 3,600 fish. They were thought to have spawned in the mainstem Methow River, Twisp River, Chewuch River and lower Beaver Creek (UCSRB 2007).

2 Current Conditions

The UCSRB (2007) describes the life history of Methow summer steelhead as follows:

Adults return to the Columbia River in the late summer and early fall. Unlike spring Chinook, most steelhead do not move upstream quickly to tributary spawning streams. A portion of the returning run overwinters in the mainstem reservoirs, passing over the Upper Columbia River dams in April and May of the following year. Spawning occurs in late spring of the calendar year following entry into the river. Currently, and for the past 20+ years, most steelhead spawning in the wild are hatchery fish. The effectiveness of hatchery fish spawning in the wild compared to naturally produced spawners is unknown at this time and may be a major factor in reducing steelhead productivity.

Juvenile steelhead rear from 1-3 years in freshwater and then adults spend 1-2 years in the ocean before returning to the Columbia River. Adult fecundity averages from 5,300 to 6,000 eggs per female.

Between 1967 and 2002 adult escapement to the Methow River ranged from 1 to 587 fish, with the highest value observed in 2001. The running 12-year geometric mean ranged from 36 to 242 adults over this same period. At the time of listing (1996), the 12-year geometric mean for adult abundance and productivity was 205 and 0.09, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Endangered
- Population Description: A mixed stock of hatchery and natural production; however, the run is dominated by hatchery-origin fish. The Methow River population is considered an “Intermediate” population by the ICTRT and by definition must have a minimum abundance of 1,000 spawners and a S/S ratio of 1.1 to be viable. The HSRG has classified this population as Primary.
- Recovery Goal for Abundance: 1,000 adults
- Productivity Improvement Expectation: The Upper Columbia River recovery plan sets a 12-year geometric mean abundance and productivity target at 1,000 and 1.1 (S/S), respectively.

- Habitat Productivity and Capacity: Productivity: 1.25; Capacity: 1,962

2.2 Current Hatchery Programs Affecting this Population

The primary hatchery program most likely to affect the Methow summer-run steelhead population is discussed below:

Methow River (Wells Stock) Summer Steelhead. This is an integrated conservation and harvest program that releases 320,000 smolts in relatively equal proportions to the Twisp River (Rkm 17.6), Chewuch River (Rkm 32) and upper Methow River near Mazama (Rkm 88). At Wells Hatchery, smolts voluntarily migrate to a collection raceway downstream of the large rearing ponds. The smolts are collected from the raceway, transported and directly released to the three release sites. Approximately 75% of the juvenile fish released are mass-marked (adipose clip) however, over 90% of the steelhead released from this program are identifiable using either ad clipping, elastomer tags or PIT-tags. Adults for broodstock are collected at Wells Dam and Wells Hatchery from the run-at-large. The WDFW estimates 5-12% of the steelhead captured at Wells are of natural-origin. Adult collection sites are being explored on the Methow River. All other incubation and rearing activities occur at Wells Hatchery. The program has an R/S value of 20.

In addition to the 320,000 described above, another 100,000 summer steelhead smolts are released from the Winthrop NFH of Wells broodstock. The Winthrop NFH, as well as the other units of the Leavenworth NFH complex, were constructed as mitigation for the construction of Grand Coulee Dam and the lost anadromous production in the Columbia Basin upstream from the site of Grand Coulee Dam.

The WDFW summer steelhead program releasing fish in the Okanogan River also collects natural broodstock from the run-at-large passing Wells Dam.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 3,316 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 179 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at

one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.4. Average abundance of natural origin spawners (NOS) would decrease from approximately 855 fish to approximately 641 fish. Harvest contribution of the natural and hatchery populations would go from approximately 1,729 fish to approximately 63 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with managers' goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Managers have stated their goals for this program as; "Supporting the recovery of ESA listed species by increasing the abundance of natural adult populations, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity." (Goal statement adopted by Habitat Conservation Plan Hatchery Committee). To achieve this end the managers have identified a current mitigation goal of 320,000 smolts for release within the basin. Managers have identified Methow summer steelhead as an important population. For the purposes of this analysis, the HSRG assumed this population should be considered a Primary population. In addition, 100,000 summer steelhead smolts are released from the Winthrop NFH to achieve their mitigation objective.

This population does not meet the standards for a Primary or a Contributing population designation. Current steelhead management does not allow for population structure above Wells Dam. Broodstock for both the Methow and Okanogan River hatchery programs are currently collected at Wells Dam with subsequent smolt releases occurring in both basins. Approximately 550,000 hatchery smolts are released annually, (420,000 to Methow; 130,000 to Okanogan) the majority of which are released directly to the stream without acclimation. Natural-origin fish collected at Wells Dam comprise up to 33% of the broodstock used in the hatchery programs and hatchery spawners have contributed up to 90% of the fish on the spawning grounds (70%

Methow; 99% Okanogan). Currently there is no means to manage hatchery adults within the Methow subbasin other than the Twisp River weir and selective fishing.

Given the existing productivity and capacity levels, it appears that a self-sustaining Methow summer steelhead population could be achieved. However, an integrated program of the current size could not be operated under current habitat conditions to satisfy standards for a Primary or Contributing population.

Recommendations

An integrated program releasing approximately 100,000 smolts could be operated to meet the standards of a Primary population designation. This could be accomplished with a pNOB of 100% and the ability to remove 75% of returning unharvested hatchery-origin adults. These smolts would be ad clipped and CWT. The HSRG suggests developing the capability to provide within basin full-term rearing to meet both conservation and fishery objectives. If this is not possible, long-term acclimation, natural broodstock collection and adult recapture capabilities should be developed within the subbasin. Control of out-of-basin hatchery steelhead also may be required. Developing these capabilities might also assist with management of the spring Chinook program.

The HSRG acknowledges that managing for the recommended PNI values may not be possible or appropriate in the near term when abundance levels are low and demographic risks to the population increase. To address this concern, managers should develop a variable sliding scale for managing abundance so that in low abundance years, more of the appropriate stock is allowed to reach the spawning grounds. The near-term focus for this component of the program should be on contributing to the conservation goals for this population.

An example of such a sliding scale would look like this:

Each year, depending on NOR run size, pNOB and pHOS are allowed to “float” or slide. The HSRG assumes managers will establish an acceptable level of removal of NORs for use in the hatchery brood. This will be a fixed percentage of the total NOR return (say 40%) and will not change, regardless of NOR return. In years of high NOR abundance, this 40% could make up 100% of the needed hatchery brood (pNOB= 100%). In that case, no HORs would be used in the hatchery brood. Hatchery fish can be allowed to reach the spawning ground (pHOS) if needed to achieve an appropriate number of fish spawning naturally (demographic benefit and use of available habitat). This however, would not be required during years of very high NOR returns as both objectives (pNOB and natural spawning) may be met with NORs.

In years of low NOR abundance, the same 40% of the NOR return would be removed for use in the hatchery brood (pNOB). However, in these years, that 40% may make up only a small part of the needed brood (i.e. pNOB 10%). In these years, enough HORs should be used to achieve needed hatchery brood and additional HORs should be allowed to spawn naturally (pHOS) to achieve the minimum acceptable level of naturally spawning.

The goal of this sliding scale is to achieve an “average” PNI over time of the desired level (0.67 or 0.5) depending on the population designation even though it may not be achieved in any one year. A good way to determine the level of NORs that should be removed each year (see above) is to review the return of NORs over a long time frame and iterate what level (30, 40, 50%) are needed, on average, to achieve the desired PNI.

In addition, a second “stepping stone” program of approximately 320,000 smolts using returning excess hatchery adults from the first program (see above) could be maintained to provide additional harvest if 90% of the unharvested hatchery adults could be removed. These smolts would only be ad clipped (no CWT) to differentiate them from the adults from the conservation

program. Facilities for this stepping stone program in the lower basin would assist in achieving required hatchery-origin fish removal rates while helping isolate this component of the program from most of the natural production areas. Unharvested hatchery returns from the 2nd stage (harvest) component would not be used for broodstock but could be used for other purposes (food bank donations, stream nutrification).

The HSRG suggests that managers consider the ecological effect of outplants on this population. While outplants may not be having a detectable long-term genetic effect resulting from direct interbreeding with the natural population, the HSRG is concerned about the ecological effects of outplanted steelhead. They may be affecting overall survival and productivity of natural-origin steelhead considering Kostow's data for summer steelhead (Kostow 2003, 2004, 2005).

Consequently, the HSRG recommends that outplanting of hatchery steelhead be discontinued (or at least minimized) wherever facilities are not available to recapture returning adults that escape harvest.

All fish should be adipose fin-clipped unless released to initiate new local broodstock or to achieve needed demographic benefits.

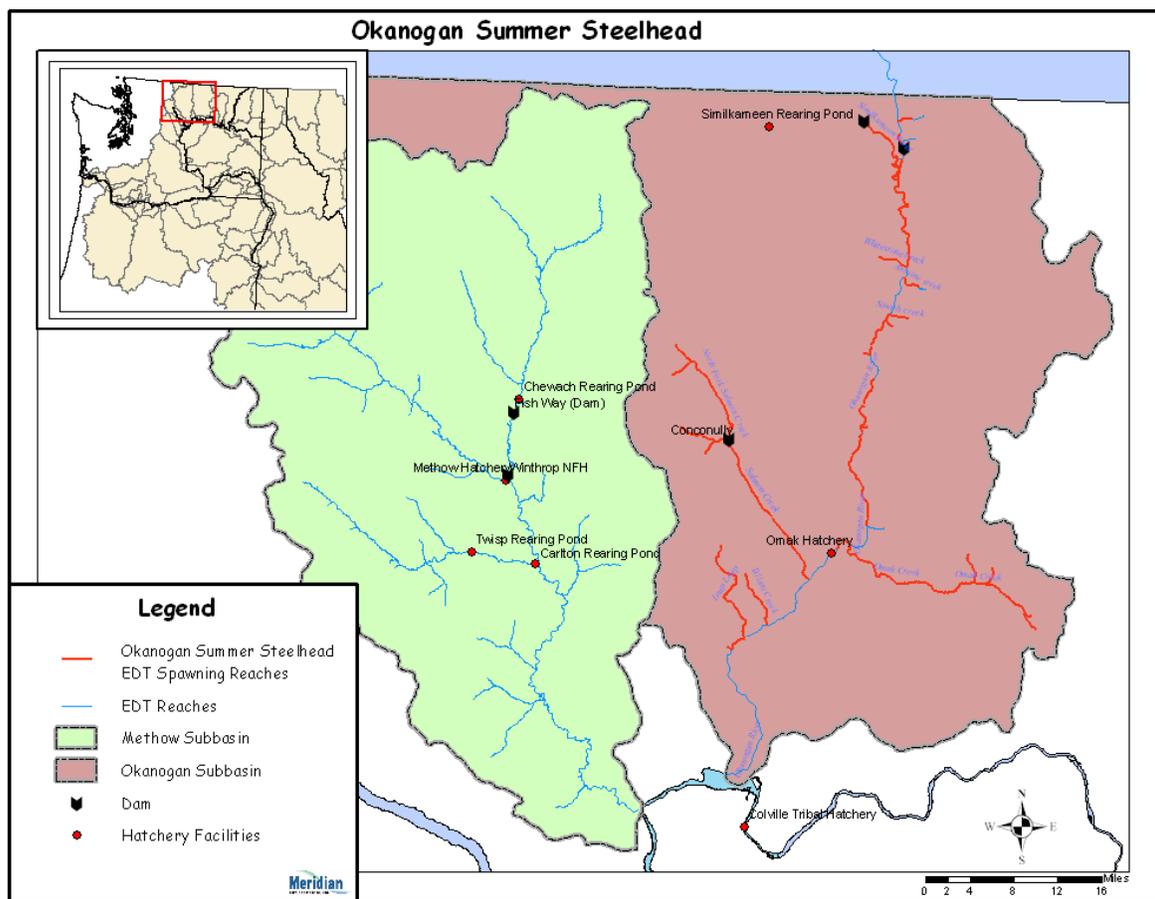
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Methow Summer Steelhead. The yellow row indicates the natural population and light green indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the addition effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 420.1 | 6% | 0% | 77% | 0.00 | 855 | 0.6 | 1,729 | 212 |
| | | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 641 | 1.4 | 63 | - |
| | None | | | | | | | | | |
| HSRG Solution | Int Both | 100.2 | 75% | 0% | 34% | 0.75 | 945 | 1.2 | 582 | 607 |
| | Stepping Stone/Seg Harv | 319.8 | 90% | | | | | | 1,545 | 2,982 |
| HSRG Solution w/ Improved Habitat | Int Both | 100.2 | 75% | 0% | 30% | 0.77 | 1,136 | 1.4 | 600 | 607 |
| | Stepping Stone/Seg Harv | 319.8 | 90% | | | | | | 1,545 | 2,982 |

Hatchery Scientific Review Group Review and Recommendations

Okanogan Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Okanogan River Summer Steelhead

Okanogan River summer steelhead are considered part of the Upper Columbia River Steelhead DPS. This DPS includes all naturally-spawned anadromous steelhead populations below natural and man-made impassable barriers in the Columbia River Basin between the Yakima River and the U.S.-Canada border. Since June 2007, the DPS has been classified as endangered under the ESA. The Okanogan River population is considered an “Intermediate” population by the Interior Columbia Technical Review Team (ICTRT). An “Intermediate” steelhead population is one that must have a minimum abundance of 1,000 spawners and a S/S ratio of 1.2 to be viable.

There are no estimates of historical summer steelhead abundance in the Okanogan River subbasin. They were thought to have spawned in the mainstem Okanogan River as well as in Salmon and Omak creeks, and possibly the Similkameen River. Summer steelhead were also distributed throughout streams in the Canadian portion of the subbasin (UCSRB 2007).

2 Current Conditions

The UCSRB (2007) describes the life history status of Okanogan summer steelhead as follows:

Adults return to the Columbia River in the late summer and early fall. Unlike spring Chinook, most steelhead do not move upstream quickly to tributary spawning streams. A portion of the returning run overwinters in the mainstem reservoirs, passing over the Upper Columbia River dams in April and May of the following year. Spawning occurs in late spring of the calendar year following entry into the river. Currently, and for the past 20+ years, most steelhead spawning in the wild are hatchery fish. The effectiveness of hatchery fish spawning in the wild compared to naturally produced spawners is unknown at this time and may be a major factor in reducing steelhead productivity.

Juvenile steelhead rear from 1 to 3 years in freshwater and then adults spend 1 to 2 years in the ocean before returning to the Columbia River. Adult fecundity averages from 5,300 to 6,000 eggs per female.

Between 1967 and 2002, adult escapement to the Okanogan River ranged from 1 to 156 fish. The running 12-year geometric mean ranged from 11 to 64 adults over this same time period. At the time of listing, the 12-year geometric mean for adult abundance and productivity was 53 and 0.09, respectively. In 2005, the Colville Tribes reported over 300 steelhead redds in the U.S. portion of the subbasin. The majority of the adults are of hatchery origin. Dam counts over Zosel Dam indicate that wild fish escapement into Canada is less than 150 fish.

Steelhead currently spawn in Omak Creek, Similkameen River, mainstem Okanogan River, Salmon Creek and streams in the Canadian portion of the subbasin (UCSRB 2007). Habitat and hatchery actions are being implemented to increase spawning levels in Salmon Creek and Omak Creek.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Endangered

- Population Description: A mixed stock of hatchery and natural production; however, the run is dominated by hatchery-origin fish. The Okanogan River population is considered an “Intermediate” population by the ICTRT, which by definition must have a minimum abundance of 1,000 spawners and a S/S ratio of 1.2 to be viable. The HSRG has classified this population as Primary.
- Recovery Goal for Abundance: 1,000 adults
- Productivity Improvement Expectation: The Upper Columbia River recovery plan sets a 12-year geometric mean abundance and productivity target at 500 and 1.2 (S/S), respectively.
- Habitat Productivity and Capacity: Productivity: 1.65; Capacity: 168

2.2 Current Hatchery Programs Affecting this Population

The primary hatchery programs most likely to affect the Okanogan summer-run steelhead population are discussed below:

1. Okanogan Similkameen Rivers (Wells Stock) Summer Steelhead. According to the HGMP, this is an integrated conservation and harvest program that may release 130,000 smolts (6 fpp) to three sites in the Okanogan River subbasin (mainstem Okanogan, Similkameen River, and Omak Creek). Fish are generally scatter-planted in the subbasin starting in April. In some years, fish have been acclimated in the Similkameen Chinook rearing pond. All juveniles released into the subbasin are adipose fin-clipped¹. Adults for the program are collected from the run at large at Wells Dam, not from the Okanogan River. Egg incubation and juvenile rearing occurs at the Wells Hatchery. The program has a R/S value of 20.
2. Cassimer Bar Steelhead: Approximately 20,000 juvenile summer steelhead are released into Omak Creek at 10-15 fpp. Fish are either acclimated in Omak Creek prior to release or are scatter-planted within the watershed. All incubation and rearing activities occurs at the Cassimer Bar Hatchery. Broodstock is collected at a weir on Omak Creek. The program has a R/S value of 20; however, this value is based on data collected for the Wells summer steelhead program. Adult returns are insufficient to develop a R/S value for the Cassimer Bar program due to the short time the program has been in operation (2004).

In the future, the Colville Tribe proposes to increase Cassimer Bar steelhead production to between 80,000 and 200,000 smolts, depending on the success of habitat restoration efforts in the subbasin. The Colville Tribe is also proposing to eliminate the Wells Hatchery program that releases 100,000 to 140,000 summer steelhead to the Okanogan River each year.

Initially, 80,000 smolts and a yet to be defined number of parr, will be released as part of an integrated conservation program for the subbasin. Also, an adult reconditioning program will be used to increase steelhead production. Broodstock will be collected at weirs located in key streams in the subbasin. The Cassimer Bar Hatchery will be upgraded to accommodate all hatchery operations.

In addition to the above-described programs, the WDFW summer steelhead program releasing fish in the Methow River also collects natural broodstock from the run-at-large passing Wells Dam.

¹ The HGMP is unclear if all or only 75% of the juvenile fish are mass-marked.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 117 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 1,085 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.7 to 1.8. Average abundance of natural-origin spawners (NOS) would decrease from approximately 76 fish to approximately 65 fish. The harvest contribution of the natural and hatchery populations would go from approximately 635 fish to approximately 9 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with managers' goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Managers have stated their goals for this program as; “Supporting the recovery of ESA listed species by increasing the abundance of natural adult populations, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity.” (Goal statement adopted by Habitat Conservation Plan Committee, Hatchery Sub-Committee). To achieve this end the managers have identified a current mitigation goal of 130,000 smolts for release within the basin. Managers have identified Okanogan summer steelhead as an important population. For the purposes of this analysis, the HSRG assumed this population should be considered a Primary population. The Upper Columbia River Steelhead ESU is listed as endangered. The Okanogan population is one of four that are essential to the survival and recovery of this ESU.

This population cannot meet the standards for a Primary or Contributing population designation due to limited habitat capacity and productivity. Given the existing habitat productivity and capacity levels, it does not appear that Okanogan summer steelhead can be a self-sustaining population at this time. An integrated program to meet standards for a Contributing or Primary population is not possible under current habitat conditions.

Current steelhead management does not allow for differentiation of populations above Wells Dam. Broodstock for both the Methow and Okanogan River hatchery programs are currently collected at Wells Dam with subsequent smolt releases occurring in both basins. Broodstock are currently collected at Wells Dam and are comprised of up to 33% natural-origin adults. Juveniles are reared at Wells Hatchery and a proportion of the progeny of this aggregate broodstock is released into the Methow and a portion into the Okanogan. About 130,000 steelhead smolts are released into the Okanogan which are typically the result of hatchery by hatchery matings. Hatchery-origin adults comprise approximately 90% of the spawning population. Currently there is no capability within the Okanogan subbasin to collect broodstock and manage adult composition on the spawning grounds other than at Omak Creek.

In addition to the Wells Hatchery program, there is a small integrated program (25,000 smolt release) using local broodstock from Omak Creek and a kelt reconditioning project at Cassimer Bar Hatchery. The Colville Tribes have plans to expand the integrated program to a total release of 200,000 smolts.

We understand that a number of habitat projects are being implemented that may allow this population to become self-sustaining.

Adult trapping in Omak Creek indicates that out-of-basin strays make up a high proportion of the natural spawning population.

Recommendations

The HSRG suggests that managers consider the ecological effect of outplants on this population. While outplants may not be having a detectable long-term genetic effect resulting from direct interbreeding with the natural population, the HSRG is concerned about the ecological effects of outplanted steelhead. They may be affecting overall survival and productivity of natural-origin steelhead considering Kostow’s data for summer steelhead (Kostow 2003, 2004, 2005).

Consequently, the HSRG recommends that outplanting of hatchery steelhead be discontinued (or

at least minimized) wherever facilities are not available to recapture returning adults that escape harvest.

All fish should be adipose fin-clipped unless they are being released to initiate new local broodstock or to achieve needed demographic benefits.

The HSRG recommends that the Okanogan population be managed using a phased transition approach, as described below. Hatchery facilities should be developed to provide within-basin full-term rearing to meet both conservation and fishery objectives. If this is not possible, long-term acclimation and adult recapture facilities should be developed within the subbasin. Control of out-of-basin hatchery steelhead also may be required.

Phase 1: Use adult returns from the existing Wells smolt release program and adults from the Colville's Omak Creek facility to develop a locally adapted hatchery population for release into the Okanogan subbasin. Reconditioned kelts also could be included in this broodstock.

Implement broodstock spawning protocols to maximize effective population size (factorial matings). As the locally adapted Okanogan hatchery population increases, phase out the Wells Hatchery releases. Collection of natural-origin adults at Wells Dam should be terminated and replaced with natural-origin fish collected from the Okanogan subbasin.

Phase 2: As benefits from planned habitat improvements occur, introduce steelhead from the locally adapted hatchery population into these habitats.

Phase 3: As habitat capacity and productivity increases and as the number of naturally-produced steelhead also increases, natural-origin adults should be incorporated into the hatchery broodstock in ever-increasing proportions to achieve a PNI greater than 0.67. Once the natural population abundance increases, more of the hatchery production could be used to provide harvest.

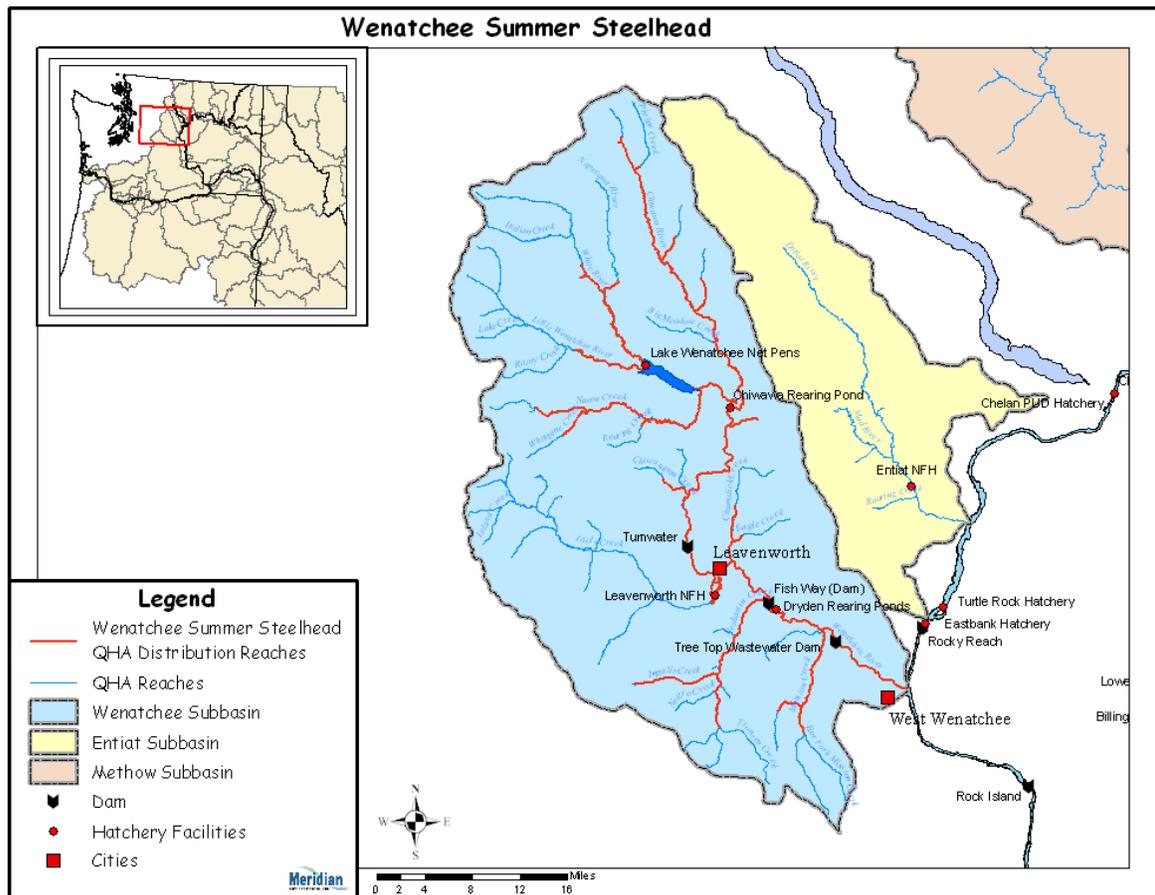
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Okanogan Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Both | 20.0 | 30% | 0% | 93% | 0.21 | 76 | 0.7 | 89 | 43 |
| | Seg Harv | 138.9 | 0% | | | | | | 546 | 0 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 65 | 1.8 | 9 | - |
| HSRG Solution | Int Both | 199.9 | 35% | 0% | 92% | 0.05 | 93 | 0.9 | 983 | 626 |
| | Seg Harv | - | 0% | | | | | | - | - |
| HSRG Solution w/ Improved Habitat | Int Both | 199.9 | 35% | 0% | 91% | 0.05 | 103 | 1.0 | 984 | 626 |
| | Seg Harv | - | 0% | | | | | | - | - |

Hatchery Scientific Review Group Review and Recommendations

Wenatchee Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Wenatchee River Summer Steelhead

Wenatchee River summer steelhead are considered part of the Upper Columbia River Steelhead DPS that includes all naturally-spawned anadromous steelhead populations below natural and man-made impassable barriers in the Columbia River Basin upstream of the Yakima River to the U.S.-Canada border. This DPS was determined by the courts to be endangered under the ESA in June of 2007. The Wenatchee River population is considered an “Intermediate” population by the Interior Columbia Technical Review Team (ICTRT). An “Intermediate” steelhead population is one that must have a minimum abundance of 1,000 spawners and a S/S ratio of 1.1 to be viable.

The historical abundance of summer steelhead in the Wenatchee River has been estimated at approximately 7,300 fish. They were thought to have spawned in lower Mission, Peshastin, Icicle, Chiwaukum, Chumstick, Beaver, and Nason creeks, and the Wenatchee, Chiwawa, Little Wenatchee and White rivers. It is likely that steelhead also spawned in some of the smaller tributaries in the subbasin (e.g., Derby Creek) (UCSRB 2007).

2 Current Conditions

Species life history information from the UCSRB (2007) states that:

Adults return to the Columbia River in the late summer and early fall. Unlike spring Chinook, most steelhead do not move upstream quickly to tributary spawning streams. A portion of the returning run overwinters in the mainstem reservoirs, passing over the Upper Columbia River dams in April and May of the following year. Spawning occurs in late spring of the calendar year following entry into the river. Currently, and for the past 20+ years, most steelhead spawning in the wild are hatchery fish. The effectiveness of hatchery fish spawning in the wild compared to naturally produced spawners is unknown at this time and may be a major factor in reducing steelhead productivity.

Juvenile steelhead rear from 1 to 3 years in freshwater. Steelhead adults spend 1-2 years in the ocean before returning to the Columbia River. Adult fecundity averages from 5,300 to 6,000 eggs per female.

Between 1967 and 2003, adult escapement to the Wenatchee River ranged from 70 to 2,864 fish. The running 12-year geometric mean ranged from 185 to 919 adults over this same period. At the time of listing, the 12-year geometric mean for adult abundance and productivity was 793 and 0.25, respectively.

Wenatchee River summer steelhead spawn in the mainstem Wenatchee River between Tumwater Canyon and Nason Creek, Chiwawa River, Nason, Icicle, Peshastin, Chumstick and Mission creeks. There is evidence that steelhead may also spawn or rear in the Little Wenatchee River, White River and Chiwaukum Creek.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Endangered
- Population Description: A mixed stock of hatchery and natural production; however, the run is dominated by hatchery-origin fish. The Wenatchee River population is considered “Intermediate” by the ICTRT. A “Intermediate” steelhead population is

one that must have a minimum abundance of 1,000 spawners and a S/S ratio of 1.1 to be viable. The HSRG has classified this population as Primary.

- Recovery Goal for Abundance: 1,000 adults
- Productivity Improvement Expectation: The Upper Columbia River recovery plan sets a 12-year geometric mean abundance and productivity target at 1,000 and 1.1 (S/S), respectively.
- Habitat Productivity and Capacity: Productivity: 2.25; Capacity: 765

2.2 Current Hatchery Programs Affecting this Population

The hatchery program that is most likely to affect the Wenatchee Summer-run Steelhead population is described below:

Wenatchee River Summer Steelhead (Eastbank). This is an integrated conservation and harvest program that can release up to 400,000 smolts (5 fpp) to Nason Creek (scatter plant), Upper Wenatchee River and the Chiwawa River acclimation site. Juveniles are acclimated at the Chiwawa River site only if it does not interfere with spring Chinook production. Only 25% of hatchery-origin juveniles are mass-marked with an adipose fin clip (50% of 2006 brood). While most fish are not adipose fin-clipped in order to maximize the return of adult steelhead to the subbasin (reduces the number harvested, as fishers must release all unmarked adults) over 90% of the steelhead released from this program are identifiable using either ad clipping, elastomer tags or PIT-tags. Broodstock are collected from the Wenatchee River at Dryden and Tumwater dams. The goal is to collect 50% NOR and 50% HOR adults for the hatchery program. Adult holding occurs at Wells Hatchery because it has cooler well water than does Eastbank Hatchery. Gametes are collected at Wells Hatchery and transferred to Eastbank Hatchery where fertilization occurs. Eggs from the latest spawning Wenatchee River steelhead are transferred to Chelan Falls Hatchery for the majority of incubation and rearing (through October) to facilitate increases in growth. This step is taken in an effort to equalize the size-at-release of steelhead smolts from early and late spawning fish.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 1,665 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 265 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater

than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.2 to 2.5. Average abundance of natural-origin spawners (NOS) would increase from approximately 379 fish to approximately 587 fish. The harvest contribution of the natural and hatchery populations would go from approximately 875 fish to approximately 75 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with managers' goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified Wenatchee summer steelhead as an important population. The Managers have stated their goals for this program as; "Supporting the recovery of ESA listed species by increasing the abundance of natural adult populations, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity" (Goal statement adopted by Habitat Conservation Plan Committee, Hatchery Sub-Committee). For the purposes of this analysis, the HSRG assumed this population should be considered a Primary population. As currently managed, it is not consistent with that designation, having a PNI of 0.38 (pNOB=50% and pHOS=80%).

The current program of approximately 400,000 smolts is direct stream-released without acclimation. Managers report that approximately 50% of the adult returns from this program stray and potentially spawn outside the Wenatchee subbasin. Direct stream releases likely

contribute significantly to this straying. Acclimation facilities are planned to address this problem.

A portion of the fish are adipose fin-clipped and a portion are elastomer tagged.

Recommendations

There are a number of solutions that would allow this population to meet the standards for a Primary population; two are described below. The HSRG recommends that all fish under any option should be adipose fin-clipped and available for harvest.

The HSRG suggests that managers consider the ecological effect of outplants on this population. While outplants may not be having a detectable long-term genetic effect resulting from direct interbreeding with the natural population, the HSRG is concerned about the ecological effects of outplanted steelhead. They may be affecting overall survival and productivity of natural-origin steelhead considering Kostow's data for summer steelhead (Kostow 2003, 2004, 2005).

Consequently, the HSRG recommends that outplanting of hatchery steelhead be discontinued (or at least minimized) wherever facilities are not available to recapture returning adults that escape harvest.

The HSRG acknowledges that managing for the recommended PNI values may not be possible or appropriate when abundance levels are low. Managers should consider demographic risks to the natural population and modify their protocols during periods of low abundance. Managers should develop a variable sliding scale for abundance so that in low abundance years, more of the appropriate population is allowed to reach the spawning grounds.

An example of such a sliding scale would look like this:

Each year, depending on NOR run size, pNOB and pHOS are allowed to "float" or slide. The HSRG assumes managers will establish an acceptable level of removal of NORs for use in the hatchery brood. This will be a fixed percentage of the total NOR return (say 40%) and will not change, regardless of NOR return. In years of high NOR abundance, this 40% could make up 100% of the needed hatchery brood (pNOB= 100%). In that case, no HORs would be used in the hatchery brood. Hatchery fish can be allowed to reach the spawning ground (pHOS) if needed to achieve an appropriate number of fish spawning naturally (demographic benefit and use of available habitat). This however, would not be required during years of very high NOR returns as both objectives (pNOB and natural spawning) may be met with NORs.

In years of low NOR abundance, the same 40% of the NOR return would be removed for use in the hatchery brood (pNOB). However, in these years, that 40% may make up only a small part of the needed brood (i.e. pNOB 10%). In these years, enough HORs should be used to achieve needed hatchery brood and additional HORs should be allowed to spawn naturally (pHOS) to achieve the minimum acceptable level of naturally spawning.

The goal of this sliding scale is to achieve an "average" PNI over time of the desired level (0.67 or 0.5) depending on the population designation even though it may not be achieved in any one year. A good way to determine the level of NORs that should be removed each year (see above) is to review the return of NORs over a long time frame and iterate what level (30, 40, 50%) are needed, on average, to achieve the desired PNI.

Option 1: Under this option, an integrated smolt program of approximately 200,000 smolts could be implemented with 100% pNOB, coupled with a harvest and recapture strategy (e.g., at Tumwater Dam) that removes 80% of the unharvested hatchery-origin adults. The primary benefit of this option would be as a gene bank or safety net in the event that the natural-origin population declines.

Option 2: Under this option, The HSRG recommends that managers implement a two-stage stepping stone program, to support the natural population and to provide harvest. The program consists of an integrated conservation component producing approximately 100,000 ad-clipped and CWT fingerlings/smolts (PNI = 0.85, pNOB = 100%). This option would also require removal of 80% of the unharvested returning adults. Excess hatchery-origin returns from the conservation component would also provide all broodstock to maintain a 2nd stage harvest component of approximately 300,000 ad clipped only fingerlings/smolts to provide addition harvest and meet the total mitigation goal of 400,000 smolts. Unharvested hatchery returns from the 2nd stage (harvest) component would not be used for broodstock but would be available for other purposes (lake plants, foodbank donation or stream nutrification). Given the ability of Tumwater Dam to remove adults, recycling of unharvested adults into the lower river for additional fishing opportunity may be feasible. This would be possible only if 80% of the unharvested hatchery-origin adults from this program could be removed (e.g., at Dryden Dam and/or Tumwater Dam). Smolt release and adult recapture facilities for this stepping stone program located in the lower basin would assist in achieving required hatchery-origin fish removal rates.

Smolts could be reared and released from an existing (e.g., Leavenworth NFH) or new facility to provide within basin full-term rearing to meet both conservation and fishery objectives. If this is not possible, at a minimum, long-term acclimation and adult recapture facilities should be developed within the subbasin.

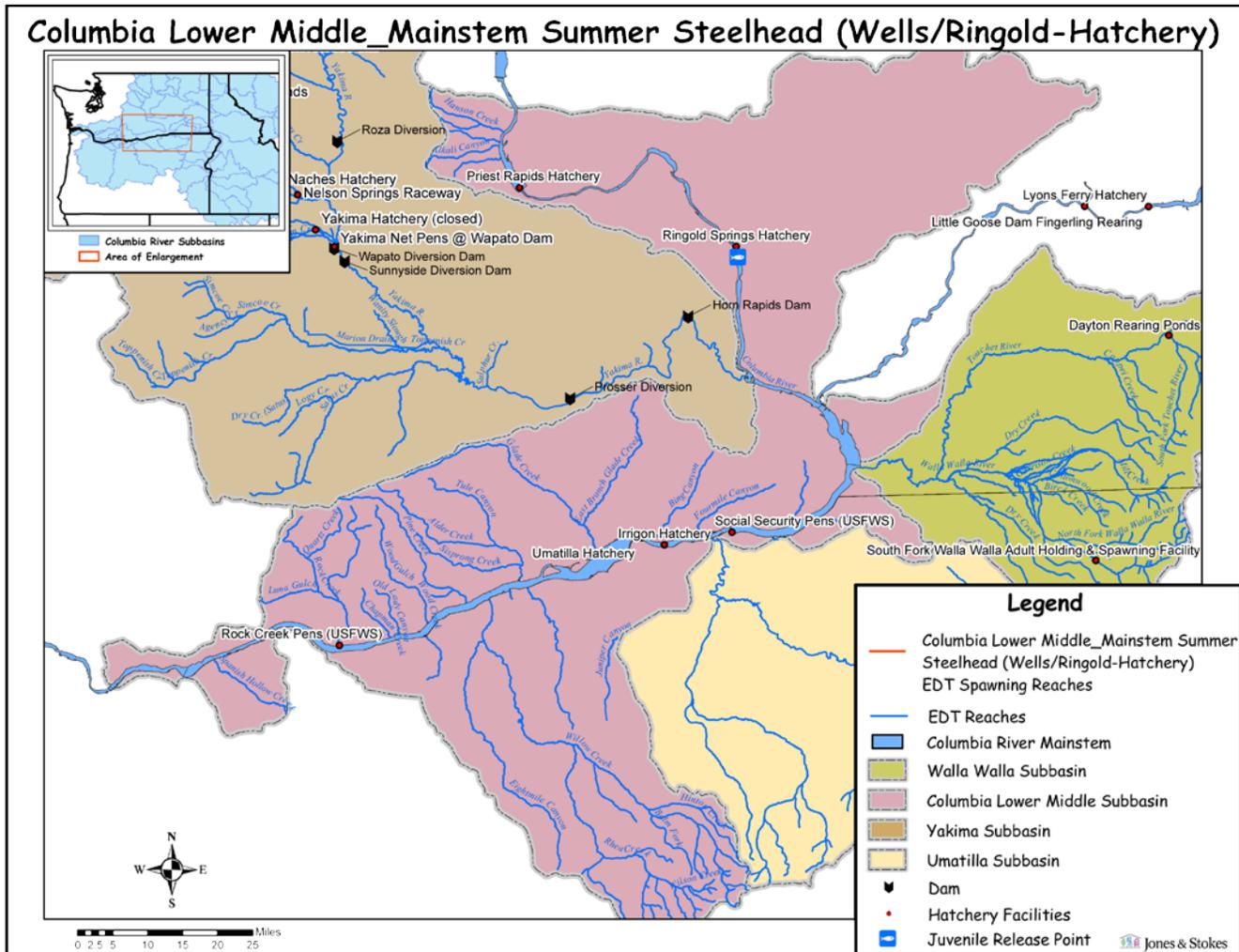
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Wenatchee Summer Steelhead. The yellow row indicates the natural population and light green indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the addition effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 401.0 | 60% | 0% | 80% | 0.38 | 379 | 1.2 | 875 | 2,389 |
| | | | | | | | | | | |
| No Hatchery | None | | | | | | | | | |
| | None | - | 0% | 0% | 0% | 1.00 | 587 | 2.5 | 75 | - |
| HSRG Solution | Int Cons | 100.1 | 80% | 80% | 18% | 0.85 | 524 | 2.4 | 688 | 722 |
| | Stepping Stone/Seg Harv | 300.7 | 80% | | | | | | 1,845 | 2,222 |
| HSRG Solution w/ Improved Habitat | Int Cons | 100.1 | 80% | 80% | 16% | 0.86 | 623 | 2.7 | 700 | 722 |
| | Stepping Stone/Seg Harv | 300.7 | 80% | | | | | | 1,845 | 2,222 |

Hatchery Scientific Review Group Review and Recommendations

Columbia Ringold Hatchery Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Ringold Hatchery Summer Steelhead

This is a segregated hatchery program and does not have an associated natural population.

2 Current Conditions

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the *natural* population.

- ESA Status: Not listed
- Population Designation: NA
- Current Viability Rating: NA
- Recovery Goal for Abundance: NA
- Productivity Improvement Expectation: NA
- Habitat Productivity and Capacity (from EDT): NA

2.2 Current Hatchery Programs Affecting this Population

The Ringold Springs steelhead program began in 1963 using primarily Skamania brood stock. In 1998, one year after Upper Columbia steelhead were listed, the broodstock source changed to Wells stock. Ringold Hatchery steelhead are managed as a segregated harvest program, and have provided an average of ~250 fish to the fishery between the Highway 395 bridge (Tri-Cities WA) and Priest Rapids Dam since 1981. The Ringold stock is classed by NOAA as an “ESU Reserve” stock for the Upper Columbia River (UCR) steelhead ESU, meaning that it might be used to bolster production in the aftermath of a catastrophic losses within the ESU proper.

Currently, a maximum of 180,000 (average 171,000) 4-5 fpp yearling smolts are released annually after ~6 months of acclimation in a 5-acre pond fed with water from Ringold Spring. Fish are released into Spring Creek, which also carries Ringold Spring water and enters the Columbia at Rkm 567 (some miles downstream of the Hanford Reach). Release is volitional and occurs between mid April and early May. All fish are ad-clipped and right ventral clipped to allow identification of Ringold fish at Wells so that they can be excluded from brood stock collected for UCR steelhead programs. Only marked hatchery fish are selected for the Ringold program. In addition, early maturing fish are selected for the Ringold broodstock to lessen chances of introgression with UCR steelhead. The hatchery includes a volunteer trap, and any wild UCR steelhead entering the trap are transported ~4 miles upstream and released.

Estimated number of hatchery strays affecting this program:

- Hatchery strays from in-basin integrated hatchery program: N/A
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: N/A

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For

integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would be unchanged. Average abundance of natural origin spawners (NOS) also would be unchanged. Harvest contribution of the natural and hatchery populations would go from 251 to 0.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The purpose of the current segregated summer steelhead program (180,000 smolts) is to provide harvest and act as a genetic reserve for upper Columbia River steelhead. The program is maintained from out-of-basin broodstock imported from Wells Hatchery. Fish currently are recycled to increase harvest opportunities. There appears to be little opportunity for genetic interaction between this segregated harvest program and natural spawning stocks.

Broodstock collection potential appears to be adequate for the needs for this program and better than for fall Chinook.

Recommendations

The HSRG recommends that managers transition to the use of local broodstock derived from returns to the Ringold facility. This would require facility upgrades to allow for adult collection, handling, holding, incubation and rearing. The HSRG recognizes that changes in the broodstock protocol will diminish the value of this population as a genetic reserve for upper Columbia River steelhead.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Columbia Ringold Hatchery Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 171.1 | 0% | | | | | | 251 | 1 |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 171.1 | 80% | | | | | | 251 | 615 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 171.1 | 80% | | | | | | 251 | 615 |

1 Salmon Chamberlain Creek Summer Steelhead (A-Run)

The Chamberlain Creek steelhead population is part of the Snake River Steelhead Distinct Population Segment (DPS). The DPS contains both A- and B-run steelhead. This population is an A-run and resides in the Salmon River Major Population Group (MPG). It is classified as threatened under the Endangered Species Act and the ICTRT identifies this population as “Basic”. A “Basic” population is one that requires a minimum abundance of 500 natural spawners and an intrinsic productivity greater than 1.30 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

Historically, it was estimated that over two million steelhead returned to the Columbia River Basin, with about 25% of these originating from the Snake River. Ice Harbor Dam counts indicate that over 100,000 steelhead returned to the Snake River in the early 1960s. There are no reliable estimates of the percentage of fish that have returned historically to the Chamberlain Creek.

2 Current Conditions

This population includes all steelhead spawning in the Wind River, Chamberlain, French, Sheep, Crooked, Bargamin and Sabe creeks, the mainstem Salmon River and other tributary streams downstream to the mouth of the Little Salmon River. Spawning occurs from mid-March through mid-June. Juveniles emigrate from the system in the spring at ages 1-4, with most emigrating at ages 2 and 3.

Current population abundance (number of adults spawning in natural production areas) is unknown. There are no weirs where steelhead escapement can be monitored and steelhead redds are not counted. For Snake River steelhead “A” run populations lacking in direct abundance and productivity data, the ICTRT developed preliminary estimates representing an average population of this run type using Lower Granite Dam natural-origin fish counts. Abundance for the average “A” run steelhead in recent years has been moderately variable. The most recent 10-year geometric mean number of natural spawners was 456 fish. The most recent 13-year SAR adjusted and delimited geometric mean of returns per spawner was 1.69.

Steelhead redds were counted by IDFG from 1990 through 1998 in Chamberlain and West Fork Chamberlain creeks. Not all spawning habitat was surveyed when counting redds, so a total population count is not available for any year. From 1990 through 1998, total redds counted each year in the two transects surveyed ranged from 0 to 11. Steelhead parr density in Chamberlain Creek has generally been less than six age-1 parr per square meter for the period 1995-2002 (NPCC 2004).

For AHA modeling, IDFG estimated natural-origin fish escapement and adjusted productivity for this population was 249 and 2.66, respectively. Although little data is available, the number of hatchery adults spawning naturally in the basin is assumed to be low.

Habitat in Chamberlain Creek has been managed as wilderness since the 1930s. The area is free of major diversions, roads, or human-induced pollution.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Snake River steelhead are listed as threatened under ESA.
- Population Description: For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- Recovery Goal for Abundance: The ICTRT defined the Chamberlain Creek A-run steelhead population as “Intermediate” and identified a minimum abundance threshold of 1,000 natural-origin adults
- Productivity Improvement Expectation: The ICTRT productivity standard associated with a population defined as “Intermediate” is 1.15.
- Habitat Productivity and Capacity: Productivity: 3.0; Capacity: 399

2.2 Current Hatchery Programs Affecting this Population

No hatchery programs are present in this area; however, AHA modeling indicates that some hatchery strays from the following program may spawn in the Chamberlain Creek:

- Salmon/ Little Salmon Summer Steelhead (A- and B-Run programs)
- Salmon/ Little Salmon Summer Steelhead (Pahsimeroi Hatchery)

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: three fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.6 to 2.7. Average abundance of natural-origin spawners (NOS) would decrease from approximately 249 fish to approximately 246 fish. The harvest contribution of the natural and hatchery populations would be unchanged at approximately 36 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Chamberlain Creek A-run steelhead that emphasizes maintaining existing natural spawning populations. Currently this population is operating consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

There are no releases of hatchery-origin steelhead within Chamberlain Creek, the Middle Fork Salmon River, or South Fork Salmon River drainages of the Salmon River Major Population Group.

Recommendations

The HSRG notes that there is a general lack of information related to steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. An effort should be made to improve this information base.

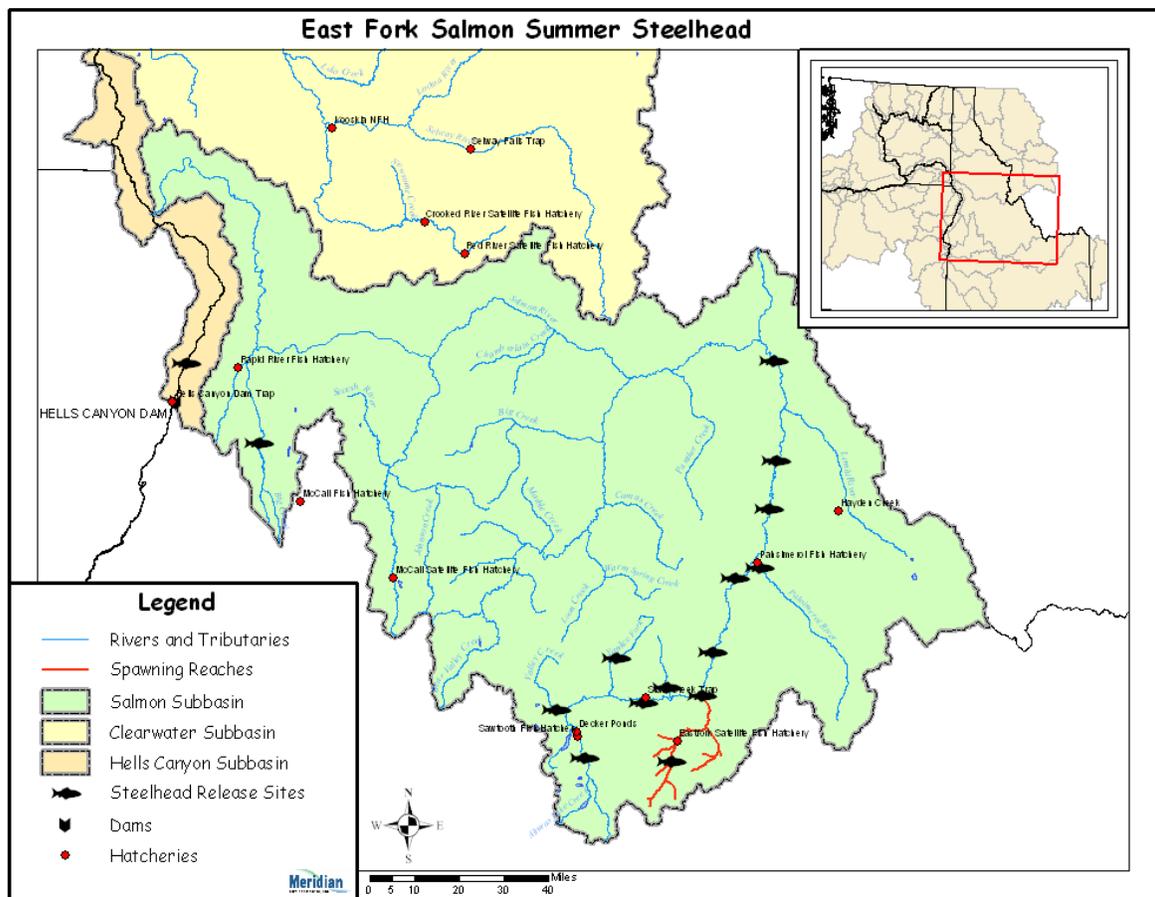
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Salmon- Chamberlain Creek Summer Steelhead (A-Run). The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 249 | 2.6 | 36 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 246 | 2.7 | 36 | - |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 249 | 2.6 | 36 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 289 | 2.9 | 42 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon River East Fork Salmon Summer Steelhead A-Run Population and Related Hatchery Programs

January 31, 2009



1 Salmon East Fork Salmon Summer Steelhead (A-Run)

The East Fork Salmon steelhead population is part of the Snake River Steelhead Distinct Population Segment (DPS). The DPS contains both A- and B-run steelhead. This population is an “A” run and is classified as threatened under the Endangered Species Act. The ICTRT classified this population as “Intermediate” but able to meet “Basic” abundance and productivity criteria for viability. A “Basic” population is one that requires a minimum abundance of 500 natural spawners and an intrinsic productivity greater than 1.30 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT..

Historically, it was estimated that over two million steelhead returned to the Columbia River Basin, with about 25% of these originating from the Snake River. Ice Harbor Dam counts indicate that over 100,000 steelhead returned to the Snake River in the early 1960s. There are no reliable estimates of the percentage of fish that returned historically to the East Fork Salmon River.

2 Current Conditions

This population includes the East Fork Salmon River and its tributaries, as well as the mainstem Salmon River and tributaries to the mouth of the Lemhi. Spawning occurs from mid-March through mid-June. Juveniles emigrate from the system in the spring at ages 1-4, with most emigrating at ages 2 and 3.

Current population abundance (number of adults spawning in natural production areas) is unknown. There is a natural abundance time series for a small portion of the population. A weir, located on the East Fork Salmon River approximately 20 miles upstream of the river’s mouth, has been operated to trap adult steelhead since 1984. No abundance information is available for the reach below the weir, in Herd Creek, or in tributaries to the Salmon River within the population boundary. An average of 28 natural-origin steelhead were trapped at the weir between 1987 and 2007.

Between the late 1970s and the late 1990s, the IDFG released Dworshak-origin, B-run steelhead in the East Fork Salmon River (at the satellite weir). In the late 1990s, the IDFG discontinued this program. The B-run steelhead program was maintained but relocated to within a few hundred yards of the mouth of the East Fork. In 2001, the IDFG initiated an integrated steelhead conservation program in the East Fork Salmon River. The program was designed to produce approximately 60,000 smolts using both natural- and hatchery-origin parents. Steelhead parr density in the East Fork Salmon River has generally been less than five age-1 parr per square meter from 1991 through 2002 (NPCC 2004).

For AHA modeling, IDFG estimated natural-origin fish escapement and adjusted productivity for the natural-origin A-Run steelhead population was 366 and 0.61, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Snake River steelhead are listed as threatened under ESA.

- Population Description: For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for a Stabilizing population designation.
- Recovery Goal for Abundance: The ICTRT defined the East Fork Salmon River A-run steelhead population as “Intermediate/Basic” and identified a minimum abundance threshold of 500 natural-origin adults.
- Productivity Improvement Expectation: The ICTRT productivity standard associated with a population defined as “Basic” is 1.30.
- Habitat Productivity and Capacity: Productivity: 1.50; Capacity: 1,048

2.2 Current Hatchery Programs Affecting this Population

There are three hatchery programs that may affect the East Fork Salmon River steelhead population.

1. Salmon East Fork Salmon (B-Run Dworshak Hatchery). This segregated hatchery program may release ~325,000 yearling steelhead to the lower East Fork Salmon River in April (close to the East Fork mouth). All juvenile fish are adipose fin-clipped prior to transport and release to target streams. Broodstock for the program is collected at Dworshak Hatchery on the Clearwater River. No natural-origin adults are used for broodstock for this program. Egg incubation and juvenile rearing can occur at Magic Valley, Hagerman and Clearwater hatcheries. The program has an R/S value of 7.1.
2. Salmon East Fork Salmon Summer Steelhead (A-Run Pahsimeroi Hatchery). This segregated hatchery program releases 60,000 yearling steelhead to the mainstem Salmon River at Tunnel Rock and 120,000 yearlings at McNabb Point. All juvenile fish are adipose fin-clipped prior to transport and release to target streams. All hatchery egg incubation and rearing activity occurs at the Pahsimeroi or Sawtooth hatcheries. The program has an R/S value of 12.6.
3. Salmon East Fork Salmon Summer Steelhead (East Fork Satellite). This integrated conservation program is designed to release 60,000 yearling steelhead annually to the East Fork Salmon River at the satellite weir site (approximately 20 miles up the East Fork Salmon River). Broodstock are collected at the satellite facility trap and spawned. Egg incubation to the eyed-state of development occurs at the Sawtooth Hatchery. Final incubation and rearing occurs at the Magic Valley Hatchery. The program has a pNOB goal of 50%. A broodstock plan is in place to allow 50% of returning natural-origin adults to spawn in the habitat. Broodstock consists of hatchery-origin returns if sufficient natural-origin adults are not available. The program has an R/S value of 7.1.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 186 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 922 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations

they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.6 to 1.2. Average abundance of natural-origin spawners (NOS) would decrease from approximately 258 fish to approximately 155 fish. The harvest contribution of the natural and hatchery populations would go from approximately 2,643 fish to approximately 44 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for the Upper Salmon River A-run steelhead that emphasizes maintaining existing natural spawning populations, maintaining current hatchery mitigation programs, and using hatchery-origin steelhead in an attempt to

augment natural production. Currently this population does not meet the HSRG-defined standards for a Primary or Contributing population (pHOS exceeds 0.1).

The upper Salmon River (upstream of the confluence of the Middle Fork Salmon River) is managed primarily for harvest. This strategy is based on the assumption that steelhead were not historically abundant in this part of the Salmon River drainage as they were in the Middle Fork and South Fork Salmon River drainages. However, managers have identified conservation objectives for the East Fork Salmon River.

The LSRCP mitigation objective for the Upper Salmon River A-run program is to return 11,660 adults from the Magic Valley Fish Hatchery program and 13,600 adults from the Hagerman National Fish Hatchery program to the project area upstream of Lower Granite Dam. Additionally, the Idaho Power Company objective is to produce 200,000 pounds of steelhead smolts for release to Salmon River waters (approximately 900,000 smolts). Idaho Power Company production is reared primarily at the Niagara Springs Fish Hatchery.

An integrated conservation hatchery program operates in the East Fork Salmon River that has a release target of 50,000 smolts. In addition to this program, other releases within this population include: 325,000 Dworshak-origin B-run steelhead near the mouth of the East Fork Salmon River; 60,000 A-run smolts to the Salmon River at Tunnel Rock; and 120,000 A-run smolts to the Salmon River at McNabb Point. All releases are unacclimated following transport from the Magic Valley rearing facilities.

Broodstock for the East Fork integrated program is collected at the satellite weir 18 miles up the East Fork Salmon River. This is a young program (operating since 2001) and the pNOB goal of 0.5 has not been consistently met. Early incubation occurs at the Sawtooth Hatchery. Final incubation and all rearing occur at the Magic Valley Hatchery.

Broodstock for the two segregated Salmon River releases is collected at the Sawtooth or Pahsimeroi hatcheries. Early incubation occurs at both broodstock stations. Final incubation and all rearing occur at the Magic Valley Hatchery or the Hagerman National Fish Hatchery. Broodstock for the B-run release at the mouth of the East Fork Salmon River is collected at the Dworshak National Fish Hatchery in the Clearwater drainage. Early incubation occurs at the Clearwater Hatchery. Final incubation and all rearing occur at the Magic Valley Hatchery.

Recommendations

If the East Fork Salmon River component of this population is to be managed for conservation, the HSRG recommends that a weir be constructed near the mouth of the river. An integrated program of approximately 100,000 smolts could be operated consistent with a Primary population designation (PNI of 0.73, pNOB of 0.75, and pHOS of 0.28). This would require removing 75% of the integrated program adults at this weir. This program could provide broodstock for the mainstem Salmon River release at the current level of 180,000 smolts. This would replace the current A-run release program where broodstock is collected at the Sawtooth and Pahsimeroi hatcheries. All unharvested hatchery-origin adults collected at the weir (other than the integrated component) would have to be removed. The HSRG sees little likelihood that the stated conservation objectives will be met if a lower river weir is not prioritized and installed. The HSRG recommends that the practice of importing first generation smolts of Dworshak Hatchery origin be transitioned to a program that uses locally adapted broodstock. The weir in the lower river would assist in transitioning this program to a locally derived broodstock.

The HSRG acknowledges that managing for the recommended PNI values may not be possible or appropriate in the near term when abundance levels are low and demographic risks to the population increase. To address this concern, managers should develop a variable sliding scale for managing abundance so that in low abundance years, more hatchery-origin fish of the appropriate population component are allowed to reach the spawning grounds to reduce demographic risk to the respective populations.

An example of such a sliding scale would look like this:

Each year, depending on NOR run size, pNOB and pHOS are allowed to “float” or slide. The HSRG assumes managers will establish an acceptable level of removal of NORs for use in the hatchery brood. This will be a fixed percentage of the total NOR return (say 40%) and will not change, regardless of NOR return. In years of high NOR abundance, this 40% could make up 100% of the needed hatchery brood (pNOB= 100%). In that case, no HORs would be used in the hatchery brood. Hatchery fish can be allowed to reach the spawning ground (pHOS) if needed to achieve an appropriate number of fish spawning naturally (demographic benefit and use of available habitat). This however, would not be required during years of very high NOR returns as both objectives (pNOB and natural spawning) may be met with NORs.

In years of low NOR abundance, the same 40% of the NOR return would be removed for use in the hatchery brood (pNOB). However, in these years, that 40% may make up only a small part of the needed brood (i.e. pNOB 10%). In these years, enough HORs should be used to achieve needed hatchery brood and additional HORs should be allowed to spawn naturally (pHOS) to achieve the minimum acceptable level of naturally spawning.

The goal of this sliding scale is to achieve an “average” PNI over time of the desired level (0.67 or 0.5) depending on the population designation even though it may not be achieved in an one year. A good way to determine the level of NORs that should be removed each year (see above) is to review the return of NORs over a long time frame and iterate what level (30, 40, 50%) are needed, on average, to achieve the desired PNI.

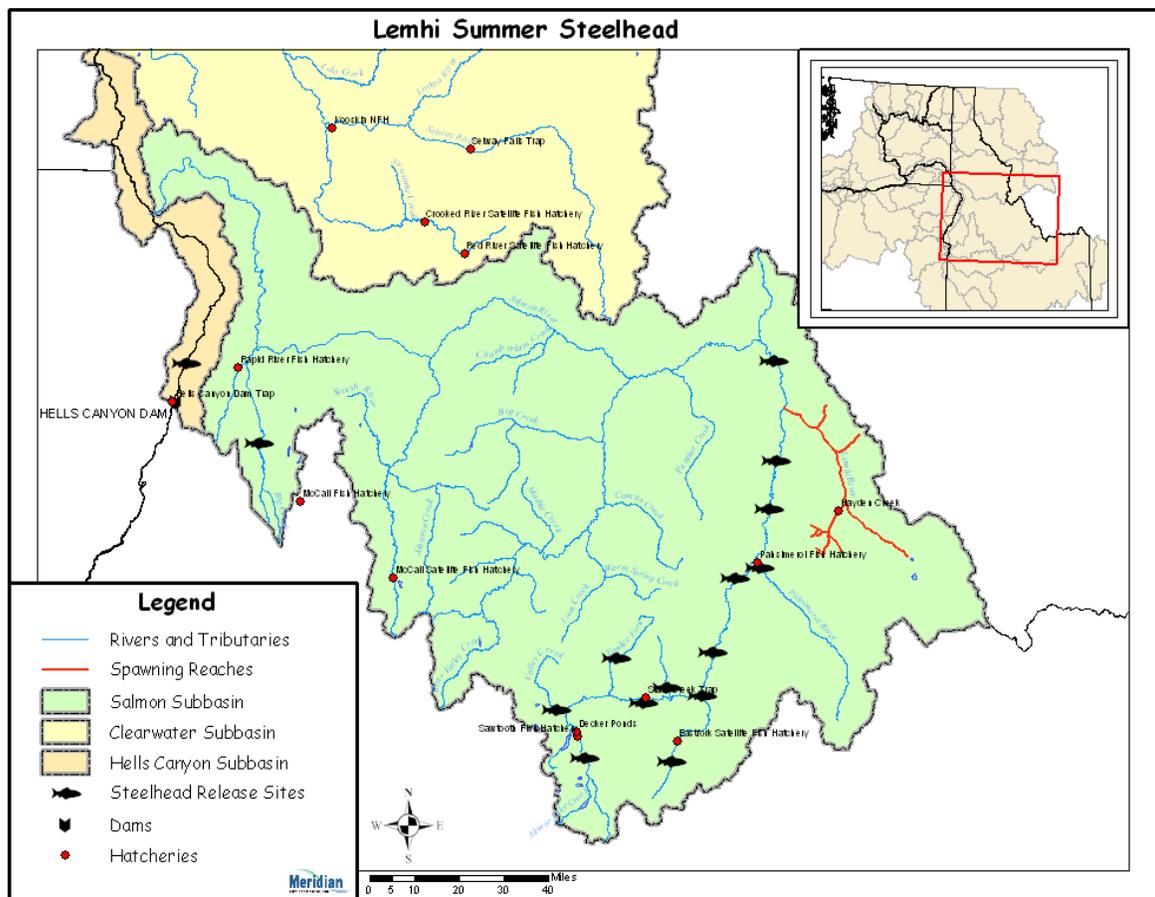
Table 1. Results of HSRG analysis of current condition and HSRG Solution for East Fork Salmon Summer Steelhead A-Run. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-----------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 49.5 | 20% | 0% | 60% | 0.08 | 258 | 0.6 | 138 | 14 |
| | B-Run Dworshak Seg Harv | 324.8 | 10% | | | | | | 1,603 | 77 |
| | A Run Pahsimeroi Seg Harv | 180.5 | 10% | | | | | | 902 | 51 |
| No Hatchery | None None | 0.0 | 0% | 0% | 0% | 1.00 | 155 | 1.2 | 44 | - |
| HSRG Solution | Int Cons | 100.1 | 75% | 0% | 41% | 0.65 | 206 | 1.0 | 161 | 137 |
| | B-Run Upper Salmon Seg Harv | 324.8 | 90% | | | | | | 1,603 | 401 |
| | Stepping Stone/Seg Harv | 180.5 | 50% | | | | | | 902 | 254 |
| HSRG Solution w/ Improved Habitat | Int Cons | 100.1 | 75% | 0% | 34% | 0.69 | 276 | 1.1 | 181 | 137 |
| | B-Run Upper Salmon Seg Harv | 324.8 | 90% | | | | | | 1,603 | 401 |
| | Stepping Stone/Seg Harv | 180.5 | 50% | | | | | | 902 | 254 |

Hatchery Scientific Review Group Review and Recommendations

Salmon River Lemhi River Summer Steelhead A-Run Population and Related Hatchery Programs

January 31, 2009



1 Salmon Lemhi River Summer Steelhead (A-Run)

The Lemhi River steelhead population is part of the Snake River Steelhead Distinct Population Segment (DPS). The DPS contains both A and B-run steelhead. This population is an “A” run and is classified as threatened under the Endangered Species Act. The ICTRT identifies this population as “Intermediate”. An “Intermediate” population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.15 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

Historically, it was estimated that over two million steelhead returned to the Columbia River Basin, with about 25% of these originating from the Snake River. Ice Harbor Dam counts indicate that over 100,000 steelhead returned to the Snake River in the early 1960s. There are no reliable estimates of the percentage of fish that have returned historically to the Lemhi River.

2 Current Conditions

The area used by this population includes all tributaries to the Salmon from the mouth of the North Fork Salmon River to the mouth of the Lemhi, as well as the Lemhi River drainage. It should be noted that steelhead currently found in the Lemhi River drainage are presumably derived primarily from several hatchery stocking efforts. Spawning occurs from mid-March through mid-June. Juveniles emigrate from the system in the spring at ages 1-4, with most emigrating at ages 2 and 3. Spawners include both natural- and hatchery-origin fish because hatchery fish are released into the Lemhi River each year.

Current population abundance (number of adults spawning in natural production areas) is unknown. For Snake River steelhead “A” run populations lacking in direct abundance and productivity data, the ICTRT developed preliminary estimates representing an average population of this run type using Lower Granite wild dam counts. Abundance for the average “A” run steelhead in recent years has been moderately variable. The most recent 10-year geometric mean number of natural spawners was 456 fish, while the most recent 13-year SAR adjusted and delimited geometric mean of returns per spawner was 1.69. Steelhead parr density in the Lemhi River has generally been less than ten age-1 parr per square meter from 1995-2002 (NPCC 2004).

For AHA modeling, IDFG estimated that natural-origin fish escapement and adjusted productivity for this population was 371 and 0.80, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River steelhead are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for a Stabilizing population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Lemhi River A-run steelhead population as “Intermediate” and identified a minimum abundance threshold of 1,000 natural-origin adults

- Productivity Improvement Expectation: The ICTRT productivity standard associated with a population defined as “Intermediate” is 1.15.
- Habitat Productivity and Capacity: Productivity: 1.8; Capacity: 1,139

2.2 Current Hatchery Programs Affecting this Population

There is a segregated hatchery program that releases 120,000 yearling (4.5 fpp) A-run steelhead to the Salmon River in April. All juvenile fish are adipose fin-clipped before being released to the stream near Red Rock. Broodstock are collected at the Pahsimeroi Hatchery weir and then transferred to either the Clearwater or Magic Valley hatcheries for incubation and rearing. No natural-origin fish are used as broodstock for this program. Juvenile fish are then transported from the rearing hatcheries to the release sites in the spring. The program has an R/S value of 12.6.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 432 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.8 to 1.6. Average abundance of natural-origin spawners (NOS) would increase from approximately 371 fish to approximately 408 fish. The harvest contribution of the natural and hatchery populations would go from approximately 855 fish to approximately 59 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Lemhi River A-run steelhead that emphasizes maintaining existing natural spawning populations and using hatchery-origin steelhead in an attempt to augment natural production. Currently this population does not meet the HSRG-defined standards for a Primary or Contributing population (pHOS exceeds 0.1).

The upper Salmon River (upstream of the confluence of the Middle Fork Salmon River) is managed primarily for harvest. This management strategy is based on the assumption that steelhead were not historically abundant in this part of the Salmon River drainage as they were in the Middle Fork and South Fork Salmon River drainages. However, managers have identified conservation objectives for the Lemhi River.

There is an unacclimated release of A-run steelhead to the Salmon River downstream of the Lemhi River (Red Rock) that originates from adults trapped at the Pahsimeroi Hatchery. The number of yearling smolts released is 120,000 (4.5 fpp). The composition of spawners in the habitat is unknown. Currently no programs release steelhead directly into the Lemhi River.

Recommendations

If this population is to be managed as a Primary or Contributing population, the ability to control spawner composition in the Lemhi River would be necessary. That could be achieved by installing a weir in the lower Lemhi River. If a weir is not constructed and a conservation strategy is still desired, the continued off-site release of steelhead in the Salmon River downstream of the mouth of the Pahsimeroi would jeopardize the success of this strategy. Acclimatization of smolts prior to release is also recommended to reduce straying and ecological risks (e.g., residualism and predation).

If an integrated program and weir are pursued - - the HSRG acknowledges that managing for the recommended PNI values may not be possible or appropriate in the near term when abundance levels are low and demographic risks to the population increase. To address this concern, managers should develop a variable sliding scale for managing abundance so that in low abundance years, more hatchery-origin fish of the appropriate

population component are allowed to reach the spawning grounds to reduce demographic risk to the respective populations.

An example of such a sliding scale would look like this:

Each year, depending on NOR run size, pNOB and pHOS are allowed to “float” or slide. The HSRG assumes managers will establish an acceptable level of removal of NORs for use in the hatchery brood. This will be a fixed percentage of the total NOR return (say 40%) and will not change, regardless of NOR return. In years of high NOR abundance, this 40% could make up 100% of the needed hatchery brood (pNOB= 100%). In that case, no HORs would be used in the hatchery brood. Hatchery fish can be allowed to reach the spawning ground (pHOS) if needed to achieve an appropriate number of fish spawning naturally (demographic benefit and use of available habitat). This however, would not be required during years of very high NOR returns as both objectives (pNOB and natural spawning) may be met with NORs.

In years of low NOR abundance, the same 40% of the NOR return would be removed for use in the hatchery brood (pNOB). However, in these years, that 40% may make up only a small part of the needed brood (i.e. pNOB 10%). In these years, enough HORs should be used to achieve needed hatchery brood and additional HORs should be allowed to spawn naturally (pHOS) to achieve the minimum acceptable level of naturally spawning.

The goal of this sliding scale is to achieve an “average” PNI over time of the desired level (0.67 or 0.5) depending on the population designation even though it may not be achieved in an one year. A good way to determine the level of NORs that should be removed each year (see above) is to review the return of NORs over a long time frame and iterate what level (30, 40, 50%) are needed, on average, to achieve the desired PNI.

The HSRG notes that there is a general lack of information about steelhead abundance, productivity, spatial structure and diversity. An effort should be made to improve this information base. Installation of a weir would provide a mechanism for this data collection.

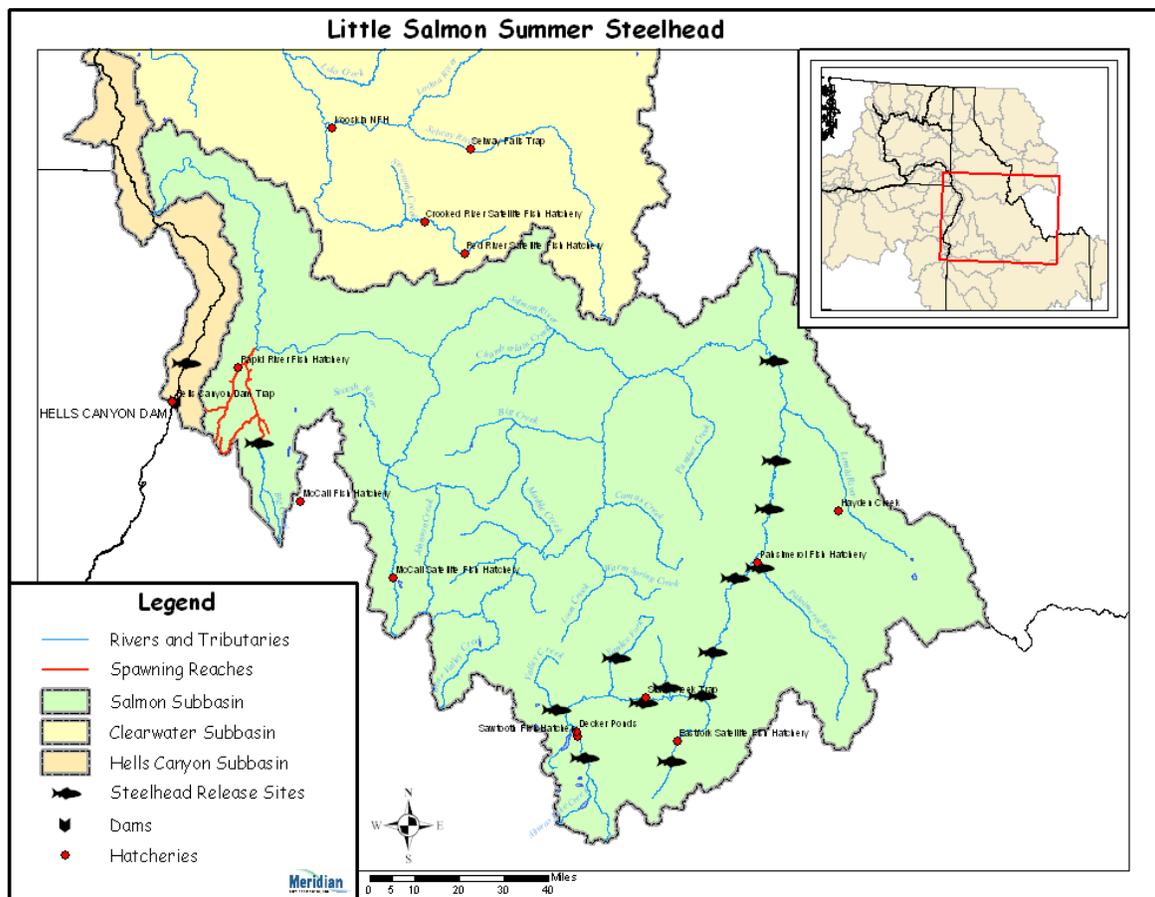
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Lemhi River Summer Steelhead A-Run. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 23% | 0.00 | 371 | 0.8 | 54 | 0 |
| | Seg Harv | 119.7 | 10% | | | | | | 801 | 46 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 408 | 1.6 | 59 | - |
| HSRG Solution | None None | - | 0% | 95% | 1% | 0.00 | 354 | 1.4 | 51 | 0 |
| | Seg Harv | 119.7 | 10% | | | | | | 801 | 46 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 95% | 1% | 0.00 | 489 | 1.6 | 71 | 0 |
| | Seg Harv | 119.7 | 10% | | | | | | 801 | 46 |

Hatchery Scientific Review Group Review and Recommendations

Salmon River Little Salmon Summer Steelhead A-Run Population and Related Hatchery Programs

January 31, 2009



1 Salmon Little Salmon River Steelhead (A-Run)

The Little Salmon River steelhead population is part of the Snake River Steelhead Distinct Population Segment (DPS). The DPS contains both A and B-run steelhead. This population is an “A” run and is classified as threatened under the Endangered Species Act. The ICTRT classified this population as “Intermediate” but able to meet “Basic” abundance and productivity criteria for viability. A “Basic” population is one that requires a minimum abundance of 500 natural spawners and an intrinsic productivity greater than 1.30 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

Historically, it was estimated that over two million steelhead returned to the Columbia River Basin, with about 25% of these originating from the Snake River. Ice Harbor Dam counts indicate that over 100,000 steelhead returned to the Snake River in the early 1960s. There are no reliable estimates of the percentage of fish that have returned historically to the Little Salmon River.

2 Current Conditions

This population of A-run fish includes the Little Salmon River and its tributaries, as well as steelhead-supporting tributaries to the lower Salmon River, downstream from the mouth of the Little Salmon (Whitebird Creek, Skookumchuck Creek, Slate Creek, and several smaller tributaries). Spawning occurs from mid-March through mid-June. Juveniles emigrate from the system in the spring at ages 1-4, with most emigrating at ages 2 and 3. Spawners include both natural- and hatchery-origin fish because both A-Run and B-Run hatchery fish are released into the Little Salmon River annually.

Current population abundance (number of adults spawning in natural production areas) is unknown. Natural-origin steelhead return data is available for Rapid River, a tributary to the Little Salmon River. Steelhead are trapped at the Raid River Fish Hatchery weir, are enumerated, and natural-origin fish are released into Rapid River upstream of the weir. The trapping facility includes a velocity-barrier type weir; fish cannot pass above the weir on their own volition. Annual numbers of steelhead trapped from 1965 through 2006 ranged from 11 to 221 fish.

For Snake River steelhead “A” run populations lacking in direct abundance and productivity data, the ICTRT developed preliminary estimates representing an average population of this run type using Lower Granite wild dam counts. Abundance for the average “A” run steelhead in recent years has been moderately variable. The most recent 10-year geometric mean number of natural spawners was 456 fish. The most recent 13-year SAR adjusted and delimited geometric mean of returns per spawner was 1.69. For AHA modeling, IDFG estimated natural-origin fish escapement and adjusted productivity for this A-Run steelhead population was 270 and 1.61, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River steelhead are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Stabilizing. The population currently meets the broodstock criteria for this population designation.

- Recovery Goal for Abundance: The ICTRT defined the Little Salmon River A-run steelhead population as “Intermediate/Basic” and identified a minimum abundance threshold of 500 natural-origin adults
- Productivity Improvement Expectation: The ICTRT productivity standard associated with a population defined as “Basic” is 1.30.
- Habitat Productivity and Capacity: Productivity: 3.60; Capacity: 474

2.2 Current Hatchery Programs Affecting this Population

The three hatchery programs that may affect the Little Salmon River steelhead population are described below.

1. Salmon Little Salmon (A-Run-Pahsimeroi/Oxbow). This is a segregated harvest program that releases ~445,000 yearling summer steelhead to the Little Salmon River at or near the mouths of Stinky Springs and Hazard Creek annually. Broodstock are collected at the Pahsimeroi Hatchery weir or at the Hells Canyon Trap located downstream of the Hells Canyon Dam. Eyed-eggs and/or unfed swim-up fry are then transferred to either the Niagara Springs Hatchery or Hagerman National Hatchery for incubation and juvenile rearing. No natural-origin fish are used as broodstock for this program. All juvenile fish released are adipose fin-clipped and a portion of these are coded wire-tagged. The program has an R/S value of 12.6.

2. Salmon Little Salmon Summer Steelhead (B-Run-Dworshak-Hatchery). This is a segregated program designed to provide B-Run summer steelhead for harvest. The program releases approximately 315,000 yearling (180-250 mm) fish to the Little Salmon River and Stinky Springs each year. All juveniles released are adipose fin-clipped and a portion also receives a coded wire-tag. Broodstock are collected at Dworshak Hatchery on the Clearwater River. Eyed-eggs are then transferred to either the Hagerman or Magic Valley hatcheries for incubation and juvenile rearing. Smolts are then transported and released to target streams in April at 4.5 fish per pound (fpp). The program has an R/S value of 7.1.

3. Salmon Little Salmon Summer Steelhead (A-Run). This program is identified as an integrated supplementation program with a production target of 200,000 yearling smolts. The program is a negotiated outcome of the US v Oregon process and designed to provide conservation benefits to the Little Salmon River natural population as well as adult steelhead for harvest. Fish are released in the Little Salmon River, Stinky Springs and Hazard Creek. Broodstock for the program is collected at the Pahsimeroi Hatchery. Natural-origin adults are not incorporated in the spawning design. Egg-incubation and rearing occurs at the Hagerman National Fish Hatchery. Fish are reared to approximately 4.5 fpp and then transported and released to target streams. The program has an R/S value of 12.6.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 2,300 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations

they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.6 to 3.2. Average abundance of natural-origin spawners (NOS) would increase from approximately 270 fish to approximately 323 fish. The harvest contribution of the natural and hatchery populations would go from approximately 5,651 fish to approximately 47 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Little Salmon River A-run steelhead that emphasizes maintaining existing natural spawning populations as well as maintaining the current hatchery mitigation program. The population does not meet the HSRG-defined standards for either a Primary or Contributing designation (pHOS exceeds 0.10). Managers operate two segregated harvest programs for terminal harvest. The Rapid River upstream of the hatchery weir is managed for natural production and between 1965 and 2006; the return of natural-origin steelhead ranged from 11 to 221 fish.

The Little Salmon River receives steelhead plants from the Oxbow Hatchery (A-run), the Pahsimeroi Hatchery (A-run) and Dworshak National Fish Hatchery (B-run). Spawning and egg incubation to the eyed stage of development occur at broodstock collection hatcheries. Final incubation and juvenile rearing for A-run segregated programs occurs at the Pahsimeroi and Niagara Springs hatcheries and at Hagerman National Fish Hatchery. No juvenile rearing of A-run steelhead occurs at Pahsimeroi Hatchery. This is a segregated program that releases approximately 645,000 (200,000 unmarked) and 315,000 A-run and B-run smolts, respectively. All releases occur in the Little Salmon River upstream of the confluence of the Rapid River and the Little Salmon River. Beginning in brood year 2009, all releases in this population will be adipose fin-clipped.

Recommendations

The HSRG has no specific recommendations to improve this program. The HSRG notes that there is a general lack of information related to steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. An effort should be made to improve this information base.

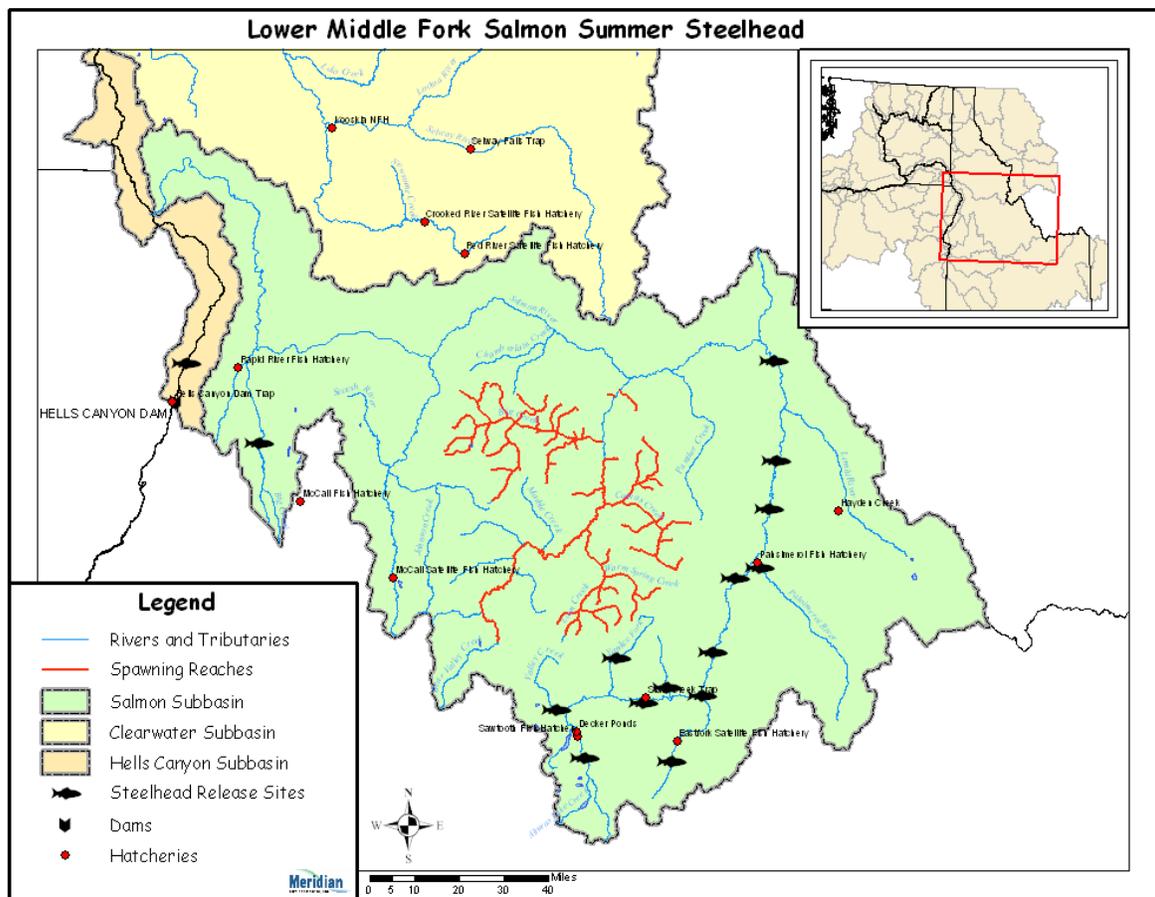
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Little Salmon River Steelhead (A-Run). The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|---------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 10% | 0% | 68% | 0.00 | 270 | 1.6 | 39 | 0 |
| | A-Run Pahsimeroi Seg Harv | 645.0 | 10% | | | | | | 4,319 | 243 |
| | B-Run Dworshak Seg Harv | 316.3 | 10% | | | | | | 1,293 | 62 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 323 | 3.2 | 47 | - |
| HSRG Solution | None None | - | 10% | 0% | 68% | 0.00 | 270 | 1.6 | 39 | 0 |
| | A-Run Pahsimeroi Seg Harv | 645.0 | 10% | | | | | | 4,319 | 243 |
| | B-Run Dworshak Seg Harv | 316.3 | 10% | | | | | | 1,293 | 62 |
| HSRG Solution w/ Improved Habitat | None None | - | 10% | 0% | 66% | 0.00 | 299 | 1.8 | 43 | 0 |
| | A-Run Pahsimeroi Seg Harv | 645.0 | 10% | | | | | | 4,319 | 243 |
| | B-Run Dworshak Seg Harv | 316.3 | 10% | | | | | | 1,293 | 62 |

Hatchery Scientific Review Group Review and Recommendations

Salmon River Lower Middle Fork Summer Steelhead B-Run Population and Related Hatchery Programs

January 31, 2009



1 Salmon Lower Middle Fork Summer Steelhead (B-Run)

The Middle Fork Salmon River Lower Mainstem steelhead population is part of the Snake River Steelhead Distinct Population Segment (DPS). The DPS contains both A- and B-run steelhead. This population is a B-run, classified as threatened under the Endangered Species Act, and as “Intermediate” by the ICTRT. An “Intermediate” population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.15 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

Historically, it was estimated that over two million steelhead returned to the Columbia River Basin, with about 25% of these originating from the Snake River. Ice Harbor Dam counts indicate that over 100,000 steelhead returned to the Snake River in the early 1960s. There are no reliable estimates of the percentage of fish that have returned historically to the Lower Middle Fork.

2 Current Conditions

This population includes all steelhead spawning in the Lower Middle Fork and its tributaries, up to and including Loon Creek. Spawning occurs from mid-March through mid-June. Juveniles emigrate from the system in the spring at ages 1-4, with most emigrating at ages 2 and 3.

Current population abundance (number of adults spawning in natural production areas) is unknown. There are no weirs where steelhead escapement can be monitored. Steelhead redds were counted by IDFG in most years from 1987 through 1998 in Middle Fork Salmon River tributary reaches. Not all spawning habitat was surveyed when counting redds, so a total population count is not available for any year. From 1987 through 1998, total redds counted each year in the two transects surveyed ranged from 0 to 143.

For extant Snake River steelhead “B” run populations above Lower Granite Dam lacking in direct abundance and productivity data, the ICTRT developed an average dataset to be applied as a surrogate for these populations. The dataset was generated using the time series of “B” run natural fish at Lower Granite Dam (TAC 2002) and dividing by nine (the number of extant “B” run populations above the dam). Abundance for the average “B” run steelhead in recent years has been moderately variable. The most recent 10-year geometric mean number of natural spawners was 272 fish. From 1986 to 1998, returns per spawner for the average “B” run steelhead dataset ranged from 0.24 (1990) to 6.63 (1998). The most recent 13-year SAR adjusted and delimited geometric mean of returns per spawner was 0.85. Steelhead parr density in the Lower Middle Fork has generally been less than four age 1 parr per square meter (NPCC 2004).

For AHA modeling, IDFG estimated natural-origin fish escapement and adjusted productivity for this population was 713 and 2.00, respectively. Although little data is available, the number of hatchery adults spawning naturally in the basin is assumed to be low.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Snake River steelhead are listed as threatened under ESA.

- Population Description: For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- Recovery Goal for Abundance: The ICTRT defined the Lower Middle Fork Salmon River B-run steelhead population as “Intermediate” and identified a minimum abundance threshold of 1,000 natural-origin adults
- Productivity Improvement Expectation: The ICTRT productivity standard associated with a population defined as “Intermediate” is 1.15.
- Habitat Productivity and Capacity: Productivity: 2.5; Capacity: 1,587

2.2 Current Hatchery Programs Affecting this Population

No hatchery programs are present in this area; however, AHA modeling indicates that some hatchery strays from the following program may spawn in the Lower Middle Fork Salmon River:

- Salmon/ Little Salmon Summer Steelhead (A and B-Run programs)

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 14 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would be unchanged at 2.0. Average abundance of natural-origin spawners (NOS) would increase from approximately 713 fish to 721 fish. The harvest contribution of the natural and hatchery populations would go from approximately 200 fish to approximately 202 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Lower Middle Fork Salmon River B-run steelhead that emphasizes maintaining existing natural spawning populations. Currently this population is operating consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

There are no releases of hatchery-origin steelhead within the Middle Fork Salmon River drainage of the Salmon River Major Population Group. The proximity of this population to the mainstem migration corridor suggests there may be a higher number of hatchery strays to this population than to other Middle Fork Salmon River populations.

Recommendations

The HSRG notes that there is a general lack of information related to steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. An effort should be made to improve this information base.

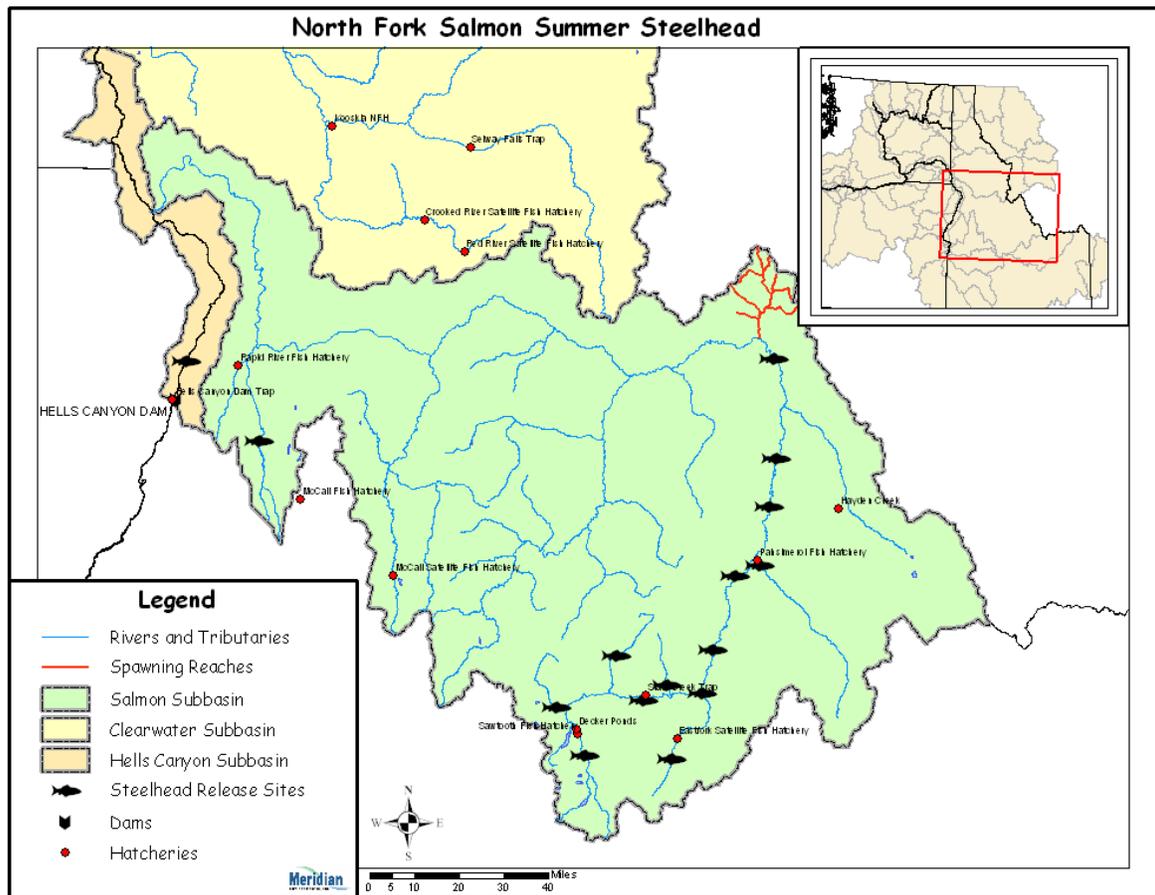
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Salmon Lower Middle Fork Summer Steelhead (B-Run). The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 713 | 2.0 | 200 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 721 | 2.0 | 202 | - |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 713 | 2.0 | 200 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 861 | 2.2 | 242 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon River North Fork Salmon Summer Steelhead A-Run Population and Related Hatchery Programs

January 31, 2009



1 Salmon North Fork Salmon Summer Steelhead (A-Run)

The North Fork Salmon River steelhead population is part of the Snake River Steelhead Distinct Population Segment (DPS). The DPS contains both A and B-run steelhead. This population is an “A” run and is classified as threatened under the Endangered Species Act and as “Basic” by the ICTRT. A “Basic” population is one that requires a minimum abundance of 500 natural-origin spawners and an intrinsic productivity greater than 1.30 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

Historically, it was estimated that over two million steelhead returned to the Columbia River Basin, with about 25% of these originating from the Snake River. Ice Harbor Dam counts indicate that over a 100,000 steelhead returned to the Snake River in the early 1960s. There are no reliable estimates of the percentage of fish that have returned historically to the North Fork Salmon.

2 Current Conditions

This population includes all steelhead spawning in the North Fork and Indian Creek as well as the mainstem Salmon River and tributaries downstream to the mouth of Panther Creek. Spawning occurs from mid-March through mid-June. Juveniles emigrate from the system in the spring at ages 1-4, with most emigrating at ages 2 and 3.

Current population abundance (number of adults spawning in natural production areas) is unknown. There are no weirs where steelhead escapement can be monitored and steelhead redds are not counted. For Snake River steelhead “A” run populations lacking in direct abundance and productivity data, the ICTRT developed preliminary estimates representing an average population of this run type using Lower Granite Dam natural-origin fish counts. Abundance for the average “A” run steelhead in recent years has been moderately variable. The most recent 10-year geometric mean number of natural spawners was 456 fish. The most recent 13-year SAR adjusted and delimited geometric mean of returns per spawner was 1.69.

For AHA modeling, IDFG estimated natural-origin fish escapement and adjusted productivity for this population was 133 and 2.46, respectively. Although little data is available, the number of hatchery adults spawning naturally in the subbasin is assumed low.

Habitat quality in the North Fork Salmon appears to be high, with some impacts to channel structure evident that reduces the amount of pool habitat present (NPCC 2004).

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River steelhead are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the North Fork Salmon River A-run steelhead population as “Basic” and identified a minimum abundance threshold of 500 natural-origin adults

- Productivity Improvement Expectation: The ICTRT productivity standard associated with a population defined as “Basic” is 1.30.
- Habitat Productivity and Capacity: Productivity: 3.0; Capacity: 226

2.2 Current Hatchery Programs Affecting this Population

There are no steelhead hatchery programs here and hatchery steelhead are not released directly into the population, although many adult hatchery steelhead that originated from upstream releases migrate upstream past the mouth of the North Fork Salmon River.

The Shoshone Bannock Tribes operate a streamside incubator program that plants approximately 1.0 million eyed-eggs in nearby watersheds. Supplementation from this program does not directly occur in the North Fork of the Salmon River.

AHA modeling indicates that some hatchery strays from the Salmon/Little Salmon Summer Steelhead (A- and B-Run) programs may spawn in the North Fork Salmon River.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: six fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.5 to 2.7. Average abundance of natural-origin spawners (NOS) would increase from approximately 133 fish to approximately 140 fish. The harvest contribution of the natural and hatchery populations would go from approximately 19 fish to approximately 20 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for North Fork Salmon River A-run steelhead that emphasizes maintaining existing natural spawning populations. Currently this population is operating consistent with the HSRG-defined standards for a Primary population (pHOS less than 0.05).

There are no releases of hatchery-origin steelhead within the North Fork Salmon River, Panther Creek, Chamberlain Creek, the Middle Fork Salmon River, or South Fork Salmon River drainages of the Salmon River Major Population Group.

Recommendations

The HSRG notes that there is a general lack of information related to steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. An effort should be made to improve this information base.

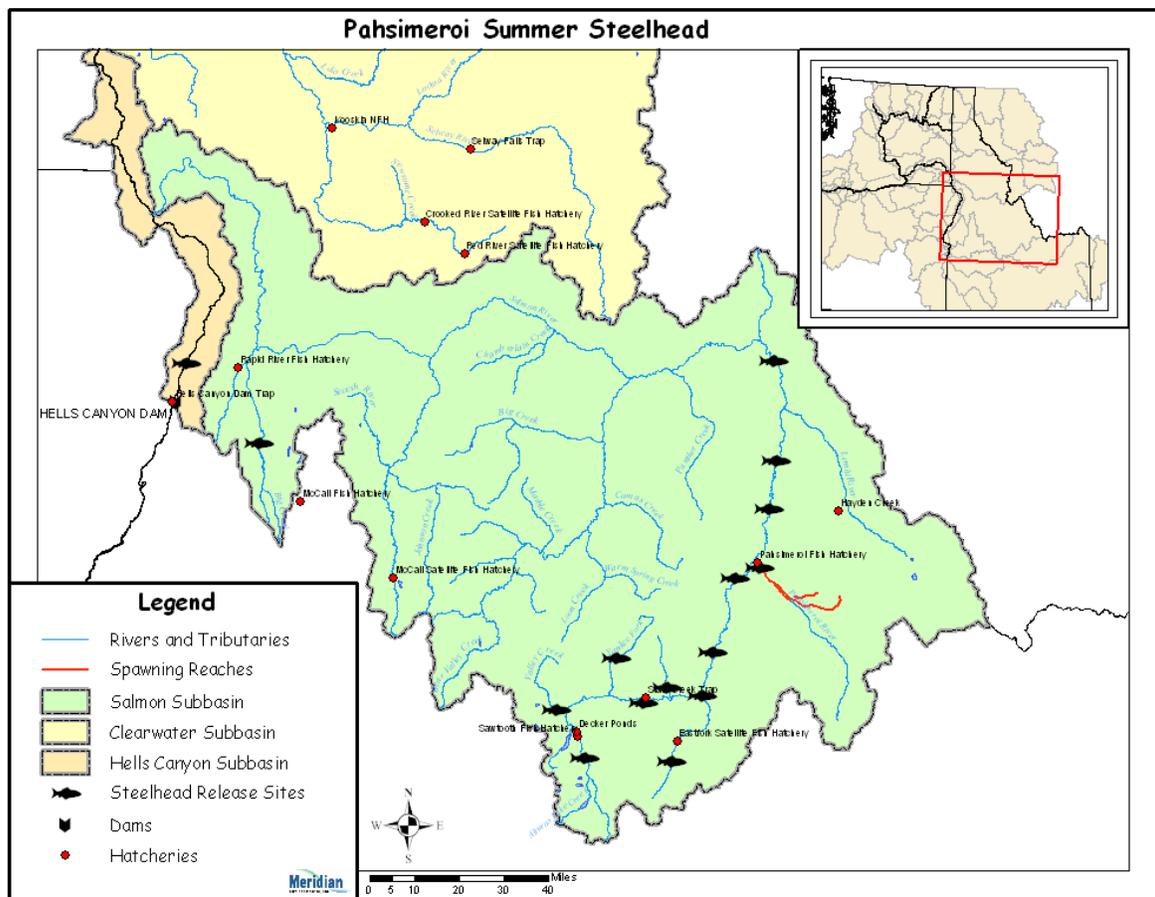
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Salmon-North Fork Salmon Summer Steelhead (A-Run). The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 133 | 2.5 | 19 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 140 | 2.7 | 20 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 133 | 2.5 | 19 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 157 | 2.8 | 23 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon River Pahsimeroi River Summer Steelhead A-Run Population and Related Hatchery Programs

January 31, 2009



1 Salmon Pahsimeroi River Summer Steelhead (A-Run)

The Pahsimeroi River steelhead population is part of the Snake River Steelhead Distinct Population Segment (DPS). The DPS contains both A and B run steelhead. The Pahsimeroi River population is an “A” run, is classified as threatened under the Endangered Species Act, and is identified as “Intermediate” by the ICTRT. An “Intermediate” population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.15 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

Historically, it was estimated that over two million steelhead returned to the Columbia River Basin, with about 25% of these originating from the Snake River. Ice Harbor Dam counts indicate that over a 100,000 steelhead returned to the Snake River in the early 1960s. There are no reliable estimates of the percentage of fish that have returned historically to the Pahsimeroi River.

2 Current Conditions

This population includes the Pahsimeroi River and its tributaries, as well as the mainstem Salmon River and all tributaries downstream to the mouth of the Lemhi River. Spawning occurs over the period from mid-march through mid-June. Juveniles emigrate from the system in the spring at ages 1-4, with the majority of the emigrant’s age 2 and 3.

Current population abundance (number of adults spawning in natural production areas) is based on counts of natural-origin steelhead intercepted at the Pahsimeroi Fish Hatchery weir. Natural-origin spawners have ranged from 17 to 460 fish since 1985. Geometric mean abundance for the most recent ten years is 73 fish. For Snake River steelhead “A” run populations lacking in direct abundance and productivity data, the ICTRT developed preliminary estimates representing an average population of this run type using Lower Granite wild dam counts. Abundance for the average “A” run steelhead in recent years has been moderately variable. The most recent 10-year geometric mean number of natural spawners was 456 fish. The most recent 13-year SAR adjusted and delimited geometric mean of returns per spawner was 1.69.

Steelhead parr density in the Pahsimeroi River has generally been less than twelve age-1 parr per square meter from 1996 through 2002 (NPCC 2004).

The Pahsimeroi Hatchery program was initiated with progeny of adult steelhead trapped at Oxbow and Hells Canyon dams from 1966 through 1968. Beginning in 1967, juvenile steelhead produced from spawning events that resulted from these collections were released in the Pahsimeroi River. Oxbow-origin smolts were released into the Pahsimeroi River and the upper Salmon River intermittently through 1970. Adult broodstock collections were initiated at the Pahsimeroi Hatchery in 1969. Returning Snake River stock and some indigenous Salmon River stock were trapped and used as broodstock. Additionally, B-run steelhead smolts of Dworshak National Fish Hatchery-origin were released into the Pahsimeroi River in 1974 and 1978.

For AHA modeling, IDFG estimated natural-origin fish escapement and adjusted productivity for the natural-origin A-Run steelhead population was 134 and 0.74, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Snake River Steelhead are listed as threatened under ESA.
- Population Description: For the purpose of this review, the HSRG assigned this population as Contributing. The population currently meets the broodstock criteria for this population designation.
- Recovery Goal for Abundance: The ICTRT defined the Pahsimeroi River A-run steelhead population as “Intermediate” and identified a minimum abundance threshold of 1,000 natural-origin adults
- Productivity Improvement Expectation: The ICTRT productivity standard associated with a population defined as “Intermediate” is 1.15.
- Habitat Productivity and Capacity: Productivity: 1.65; Capacity: 1,029

2.2 Current Hatchery Programs Affecting this Population

The single hatchery program that may affect the Pahsimeroi River steelhead population is described below.

Salmon Pahsimeroi (A-Run-Pahsimeroi). This is a segregated harvest program with a broad planting strategy. Within the Pahsimeroi population unit, the following releases occur:

Pahsimeroi River at the hatchery site: 860,000 smolts

Salmon River at Colston Corner: 140,000 smolts

Salmon River at Shoup Bridge: 80,000 smolts

Broodstock used to generate smolts for these releases are collected at the Pahsimeroi Hatchery weir or the Sawtooth Hatchery weir. No natural-origin fish are used as broodstock for this program. Spawning and early egg incubation occurs at both hatcheries. Final incubation and all rearing occur at Hagerman National Hatchery, Magic Valley Hatchery, and Niagara Springs Hatchery. All juvenile fish are adipose fin-clipped and a portion of receive coded wire and PIT-tags. Juveniles are transported to release sites in mid-April. The program has an R/S value of 12.6.

Few hatchery fish are present in the Pahsimeroi River because a weir located at the Pahsimeroi Hatchery is able to remove more than 95% of all hatchery-origin adult returns to the subbasin.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 43 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of

the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.8 to 1.5. Average abundance of natural-origin spawners (NOS) would increase from approximately 52 fish to approximately 309 fish. The harvest contribution of the natural and hatchery populations would go from approximately 5,441 fish to approximately 45 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Pahsimeroi River A-run steelhead that emphasizes maintaining existing natural spawning populations as well as maintaining the current hatchery mitigation program. Currently this population is consistent with the HSRG-defined standards for a Contributing population (pHOS less than 0.1).

The upper Salmon River (upstream of the confluence of the Middle Fork Salmon River) is managed primarily for harvest. This management strategy is based on the assumption

that steelhead were not historically abundant in this part of the Salmon River drainage as they were in the Middle Fork and South Fork Salmon River drainages.

The LSRCP mitigation objective for the Upper Salmon River A-run program is to return 11,660 adults from the Magic Valley Fish Hatchery program and 13,600 adults from the Hagerman National Fish Hatchery program to the project area upstream of Lower Granite Dam. Additionally, the Idaho Power Company objective is to produce 200,000 pounds of steelhead smolts (approximately 900,000 smolts) for release to Salmon River waters. Idaho Power Company production is reared exclusively at the Niagara Springs Fish Hatchery.

There is a segregated harvest release at the Pahsimeroi Hatchery and in the mainstem Salmon River downstream of the Pahsimeroi River. Based on coded wire-tag recovery, there is no evidence that these fish stray into other natural production areas; however, little information is available to describe the location of adult returns other than at fixed weir sites or through recoveries associated with mainstem sport fisheries.

A-run broodstock are trapped at the Pahsimeroi and Sawtooth hatcheries. Spawning and early incubation occurs at both facilities. For these releases, no natural-origin adults are incorporated in the spawning design. Final incubation and juvenile rearing occurs at Hagerman National Fish Hatchery, Magic Valley Fish Hatchery, and Niagara Springs Fish Hatchery. Smolts produced from broodstock programs at the Pahsimeroi and Sawtooth hatcheries undergo wide distribution in the Salmon River drainage. All smolts released within this population group are adipose fin-clipped with a portion coded wire and PIT-tagged for evaluation purposes.

There are two unacclimated releases of A-run steelhead to the Salmon River between the Lemhi and the Pahsimeroi rivers that originate from adults trapped at the Pahsimeroi Hatchery (one site) and/or Sawtooth Hatchery (one site). The number of yearling smolts released in the river section between the Lemhi River and the Pahsimeroi is 220,000. In addition, there is an unacclimated release of 860,000 smolts directly below the weir on the Pahsimeroi. Currently only natural-origin fish are passed upstream of the weir on the Pahsimeroi River, which is very effective at removing hatchery-origin adults.

Recommendations

The HSRG recommends sourcing broodstock from the Pahsimeroi Hatchery for releases that occur between the Pahsimeroi and Lemhi rivers.

The HSRG notes that there is a general lack of information related to steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. An effort should be made to improve this information base.

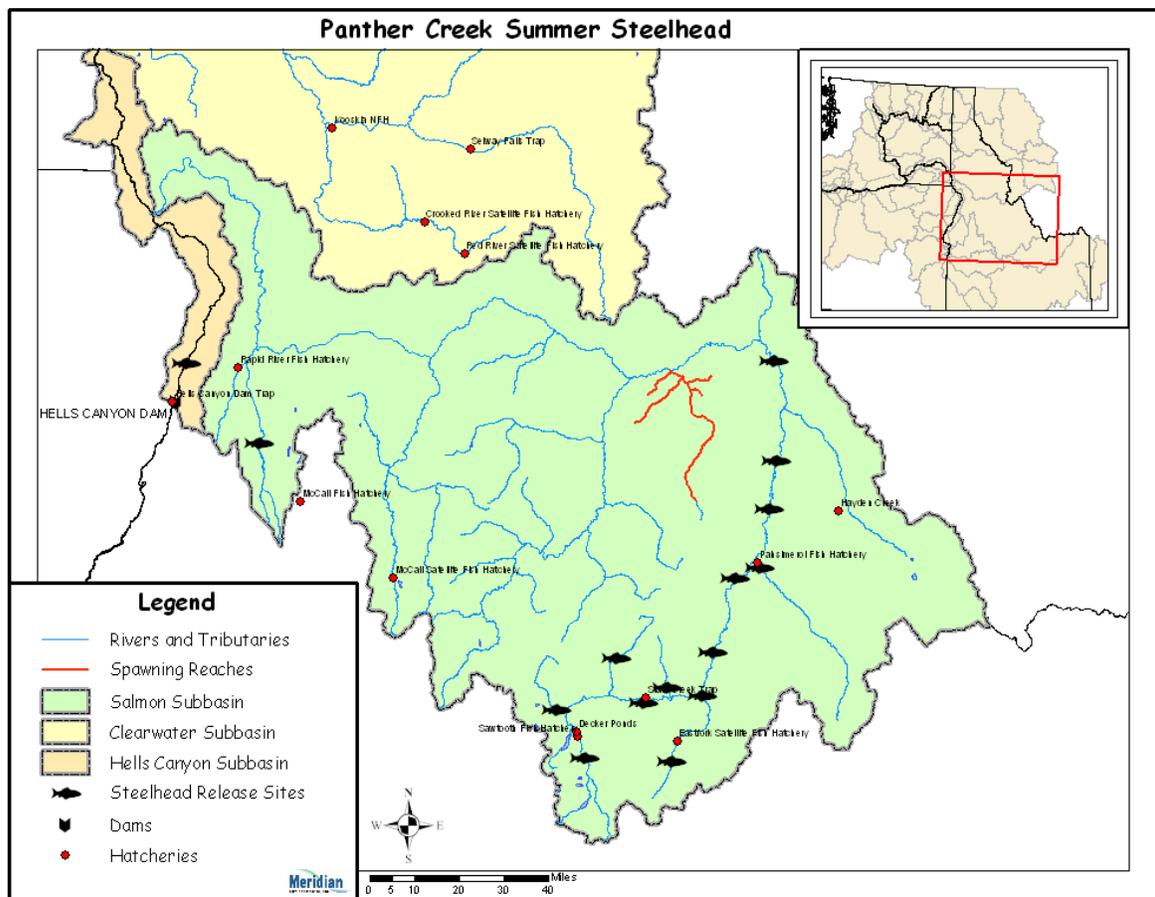
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Pahsimeroi River Summer Steelhead (A-Run). The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | 0.0 | 0% | 0% | 17% | 0.00 | 52 | 0.8 | 8 | 0 |
| | Seg Harv | 1086.8 | 90% | | | | | | 5,433 | 2,162 |
| No Hatchery | None None | 0.0 | 0% | 0% | 0% | 1.00 | 309 | 1.5 | 45 | - |
| HSRG Solution | None None | 0.0 | 0% | 0% | 14% | 0.00 | 55 | 0.8 | 8 | 0 |
| | Seg Harv | 1081.3 | 90% | | | | | | 5,406 | 2,151 |
| HSRG Solution w/ Improved Habitat | None None | 0.0 | 0% | 0% | 5% | 0.00 | 169 | 1.1 | 25 | 0 |
| | Seg Harv | 1081.3 | 90% | | | | | | 5,406 | 2,151 |

Hatchery Scientific Review Group Review and Recommendations

Salmon River Panther Creek Summer Steelhead A-Run Population and Related Hatchery Programs

January 31, 2009



1 Salmon Panther Creek Summer Steelhead (A-Run)

The Panther Creek steelhead population is part of the Snake River Steelhead Distinct Population Segment (DPS). The DPS contains both A and B-run steelhead. The Panther Creek population is an “A” run, classified as threatened under the Endangered Species Act, and as “Basic” by the ICTRT. A “Basic” population is one that requires a minimum abundance of 500 natural-origin spawners and an intrinsic productivity greater than 1.30 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

Historically, it was estimated that over two million steelhead returned to the Columbia River Basin, with about 25% of these originating from the Snake River. Ice Harbor Dam counts indicate that over a 100,000 steelhead returned to the Snake River in the early 1960s. There are no reliable estimates of the percentage of fish that have returned historically to the Panther Creek.

2 Current Conditions

This population includes all steelhead spawning in the Panther and Owl creek drainages as well as the mainstem Salmon River and tributaries downstream to the mouth of Chamberlin Creek. By the 1950s, steelhead were likely extirpated in Panther Creek due to mining activities; however, these activities had little effect on the Owl Creek steelhead population. Spawning occurs from mid-March through mid-June. Juveniles emigrate from the system in the spring at ages 1-4, with most emigrating at ages 2 and 3.

Current population abundance (number of adults spawning in natural production areas) is unknown. For Snake River steelhead “A” run populations lacking in direct abundance and productivity data, the ICTRT developed preliminary estimates representing an average population of this run type using Lower Granite wild dam counts. Abundance for the average “A” run steelhead in recent years has been moderately variable. The most recent 10-year geometric mean number of natural spawners was 456 fish. The most recent 13-year SAR adjusted and delimited geometric mean of returns per spawner was 1.69.

For AHA modeling, IDFG estimated natural-origin fish escapement and adjusted productivity for this population was 183 and 1.76, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Snake River Steelhead are listed as threatened under ESA.
- Population Description: For the purpose of this review, the HSRG assigned this population as Stabilizing. The population currently meets the broodstock criteria for a Primary population designation.
- Recovery Goal for Abundance: The ICTRT defined the Panther Creek A-run steelhead population as “Basic” and identified a minimum abundance threshold of 500 natural-origin adults
- Productivity Improvement Expectation: The ICTRT productivity standard associated with a population defined as “Basic” is 1.30.
- Habitat Productivity and Capacity: Productivity: 2.0; Capacity: 428

2.2 Current Hatchery Programs Affecting this Population

No hatchery programs currently release smolts in this area. Although little information is available, the number of stray steelhead in Panther Creek is thought to be low. There is a streamside incubator (SSI) program that plants eyed-eggs in Panther Creek. This program is described below.

Shoshone Bannock Tribes SSI Program. Approximately 1.0 million eyed steelhead eggs from Sawtooth and Pahsimeroi fish hatcheries are transferred to remote upwellers where they are incubated on river water to mimic natural hatch timing in the system. Eggs are planted in Yankee Fork, Basin Creek, Morgan Creek, Indian Creek and Panther Creek. Broodstock for the program is collected at Sawtooth and Pahsimeroi hatcheries (about 500,000 from each facility).

AHA modeling indicates however that some hatchery strays from the following programs may also spawn in Panther Creek:

- Salmon/Little Salmon Summer Steelhead (A-Run programs)

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: three fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.7 to 1.8. Average abundance of natural-origin spawners (NOS) would decrease from approximately 183 fish to approximately 181 fish. The harvest contribution of the natural and hatchery populations would go from approximately 27 fish to approximately 26 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Panther Creek A-run steelhead that emphasizes maintaining existing natural spawning populations and using hatchery-origin steelhead in an attempt to augment natural production. Currently this population is not operating consistent with the HSRG-defined standards of either a Primary or Contributing population (pHOS greater than 0.10). There are no releases of hatchery-origin steelhead within Panther Creek, Chamberlain Creek, the Middle Fork Salmon River, or South Fork Salmon River drainages of the Salmon River Major Population Group. However, Panther Creek is one of several streams that receive eyed steelhead eggs as part of the program operated by the Shoshone-Bannock Tribes.

Recommendations

The HSRG notes that there is a general lack of information related to steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. An effort should be made to improve this information base.

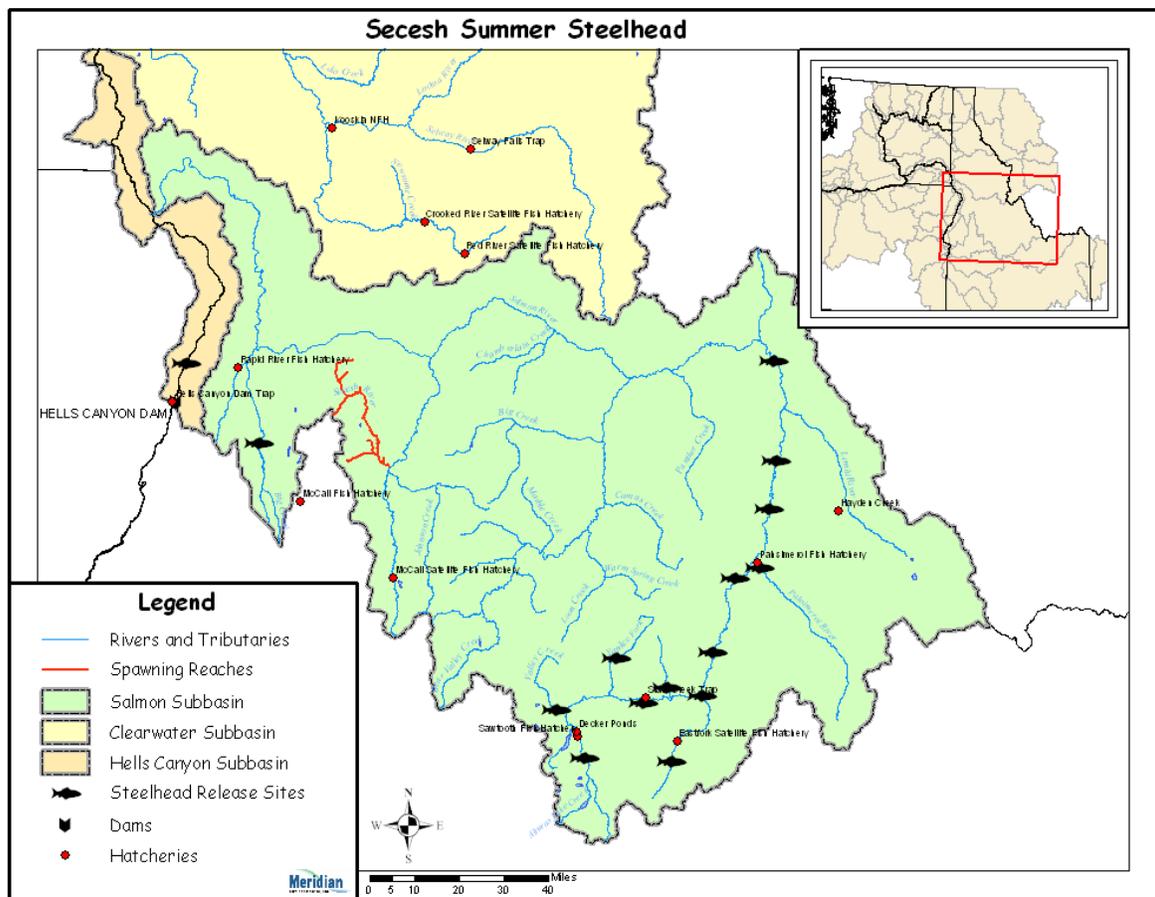
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Salmon- Panther Creek Summer Steelhead A-Run. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 183 | 1.7 | 27 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 181 | 1.8 | 26 | - |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 183 | 1.7 | 27 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 227 | 1.9 | 33 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon River Secesh River Summer Steelhead B-Run Population and Related Hatchery Programs

January 31, 2009



1 Salmon Secesh River Summer Steelhead (B-Run)

The Secesh River steelhead population is part of the Snake River Steelhead Distinct Population Segment (DPS). The DPS contains both A- and B-run steelhead. The Secesh River population is B-run, classified as threatened under the Endangered Species Act, and as “Basic” by the ICTRT. A “Basic” population is one that requires a minimum abundance of 500 natural spawners and an intrinsic productivity greater than 1.30 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

Historically, it was estimated that over two million steelhead returned to the Columbia River Basin, with about 25% of these originating from the Snake River. Ice Harbor Dam counts indicate that over a 100,000 steelhead returned to the Snake River in the early 1960s.

2 Current Conditions

This population includes all steelhead spawning in the Secesh River and its tributaries. Spawning occurs from mid-March through mid-June. Juveniles emigrate from the system in the spring at ages 1-4, with most emigrating at ages 2 and 3.

Current population abundance (number of adults spawning in natural production areas) is unknown. For extant Snake River steelhead “B” run populations above Lower Granite Dam lacking in direct abundance and productivity data, the ICTRT has developed an average dataset to be applied as a surrogate for these populations. The dataset was generated using the time series of “B” run natural fish at Lower Granite Dam (TAC report 2002) and dividing by nine (the number of extant “B” run populations above the dam). Abundance for the average “B” run steelhead in recent years has been moderately variable. The most recent 10-year geometric mean number of natural spawners was 272 fish. From 1986 to 1998, returns per spawner for the average “B” run steelhead dataset ranged from 0.24 (1990) to 6.63 (1998). The most recent 13-year SAR adjusted and delimited geometric mean of returns per spawner was 0.85. Steelhead parr density in other areas of the South Fork Salmon River has generally been less than four age 1 parr per square meter (NPCC 2004).

For AHA modeling, IDFG estimated natural-origin fish escapement and adjusted productivity for this population was 181 and 2.23, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Snake River Steelhead are listed as threatened under ESA.
- Population Description: For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- Recovery Goal for Abundance: The ICTRT defined the Secesh River B-run steelhead population as “Basic” and identified a minimum abundance threshold of 500 natural-origin adults
- Productivity Improvement Expectation: The ICTRT productivity standard associated with a population defined as “Basic” is 1.30.
- Habitat Productivity and Capacity: Productivity: 3.0; Capacity: 342

2.2 Current Hatchery Programs Affecting this Population

No hatchery programs are present in this area. Although little data is available, the number of hatchery adults spawning naturally in the basin is assumed low.

AHA modeling indicates however that some hatchery strays from the following programs may spawn in the Secesh River:

- Salmon/ Little Salmon Summer Steelhead (A- and B-Run programs)

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: eight fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.3 to 2.4. Average abundance of natural-origin spawners (NOS) would increase from approximately 181 fish to approximately 182 fish.

The harvest contribution of the natural and hatchery populations would be unchanged at approximately 51 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Secesh River B-run steelhead that emphasizes maintaining existing natural spawning populations. Currently this population is operating consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

There are no releases of hatchery-origin steelhead in the South Fork Salmon River drainage of the Salmon River Major Population Group.

Recommendations

The HSRG notes that there is a general lack of information related to steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. An effort should be made to improve this information base.

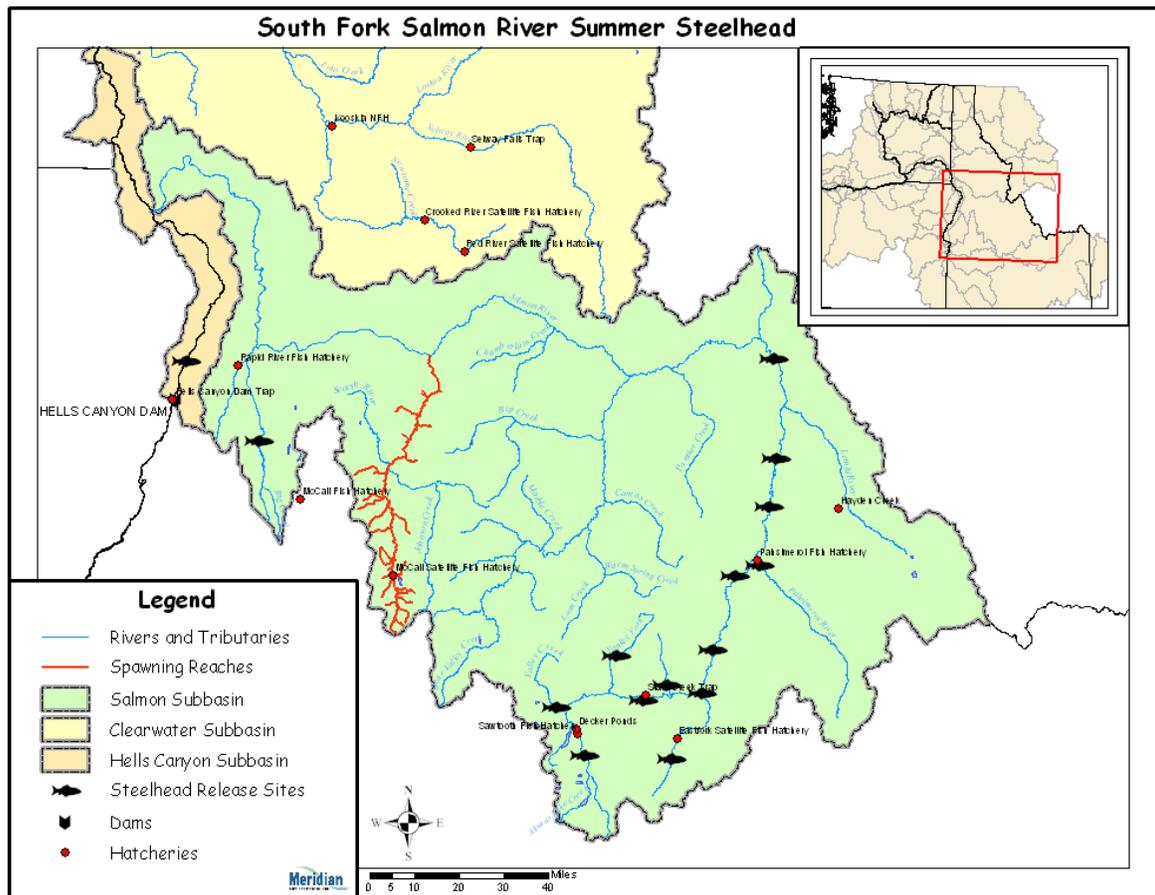
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Salmon Secesh River Summer Steelhead B-Run. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 181 | 2.3 | 51 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 182 | 2.4 | 51 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 181 | 2.3 | 51 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 214 | 2.5 | 60 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon River South Fork Summer Steelhead B-Run Population and Related Hatchery Programs

January 31, 2009



1 Salmon South Fork Summer Steelhead (B-Run)

The South Fork Salmon River steelhead population is part of the Snake River Steelhead Distinct Population Segment (DPS). The DPS contains both A- and B-run steelhead. The South Fork Salmon River population is a B-run and resides in the Salmon River MPG. This population is classified as threatened under the Endangered Species Act and is designated “Intermediate” by the ICTRT. An “Intermediate” population is one that requires a minimum abundance of 1,000 natural-origin spawners and an intrinsic productivity greater than 1.15 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

Historically, it was estimated that over two million steelhead returned to the Columbia River Basin, with about 25% of these originating from the Snake River. Ice Harbor Dam counts indicate that over a 100,000 steelhead returned to the Snake River in the early 1960s. There are no reliable estimates of the percentage of fish that historically returned to the South Fork Salmon.

2 Current Conditions

This population includes all steelhead spawning in the South Fork and its tributaries with the exception of the Secesh River. Spawning occurs from mid-March through mid-June. Juveniles emigrate from the system in the spring at ages 1-4, most emigrating at ages 2 and 3.

Current population abundance (number of adults spawning in natural production areas) is unknown. A weir (associated with the summer Chinook program) is present on the South Fork Salmon River but is not operated to enumerate steelhead escapement. Steelhead redds were counted by IDFG from 1987 through 1998 in Johnson Creek and 1990 through 1998 in the mainstem South Fork Salmon River. Not all spawning habitat was surveyed when counting redds, so a total population count is not available for any year. From 1991 through 1998, total redds counted each year in five transects surveyed ranged from 30 to 248.

For extant Snake River steelhead “B” run populations above Lower Granite Dam lacking in direct abundance and productivity data, the ICTRT developed an average dataset to be applied as a surrogate for these populations. The dataset was generated using the time series of “B” run natural-origin fish at Lower Granite Dam (TAC report 2002) and dividing by nine (the number of extant “B” run populations above the dam). Abundance for the average “B” run steelhead in recent years has been moderately variable. The most recent 10-year geometric mean number of natural spawners was 272 fish. From 1986-1998, returns per spawner for the average “B” run steelhead dataset ranged from 0.24 (1990) to 6.63 (1998). The most recent 13-year SAR adjusted and delimited geometric mean of returns per spawner was 0.85. Steelhead parr density in the South Fork has generally been less than four age-1 parr per square meter (NPCC 2004).

For AHA modeling, IDFG estimated natural-origin fish escapement and adjusted productivity for this population was 576 and 2.32, respectively. Although little data is available, the number of hatchery adults spawning naturally in the basin is assumed to be low.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Steelhead are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the South Fork Salmon River B-run steelhead population as “Intermediate” and identified a minimum abundance threshold of 1,000 natural-origin adults
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Intermediate” is 1.15.
- **Habitat Productivity and Capacity:** Productivity: 3.0; Capacity: 1,115

2.2 Current Hatchery Programs Affecting this Population

No hatchery programs are present in this area; however, AHA modeling indicates that some hatchery strays from the following programs may spawn in the South Fork Salmon River:

- Salmon Little Salmon Summer Steelhead (A- and B-Run programs)

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 19 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.3 to 2.4. Average abundance of natural-origin spawners (NOS) would increase from approximately 576 fish to approximately 593 fish. The harvest contribution of the natural and hatchery populations would go from approximately 161 fish to approximately 166 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for South Fork Salmon River B-run steelhead that emphasizes maintaining existing natural spawning populations. Currently this population is operating consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

There are no releases of hatchery-origin steelhead within the South Fork Salmon River drainage of the Salmon River Major Population Group.

Recommendations

The HSRG notes that there is a general lack of information related to steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. An effort should be made to improve this information base.

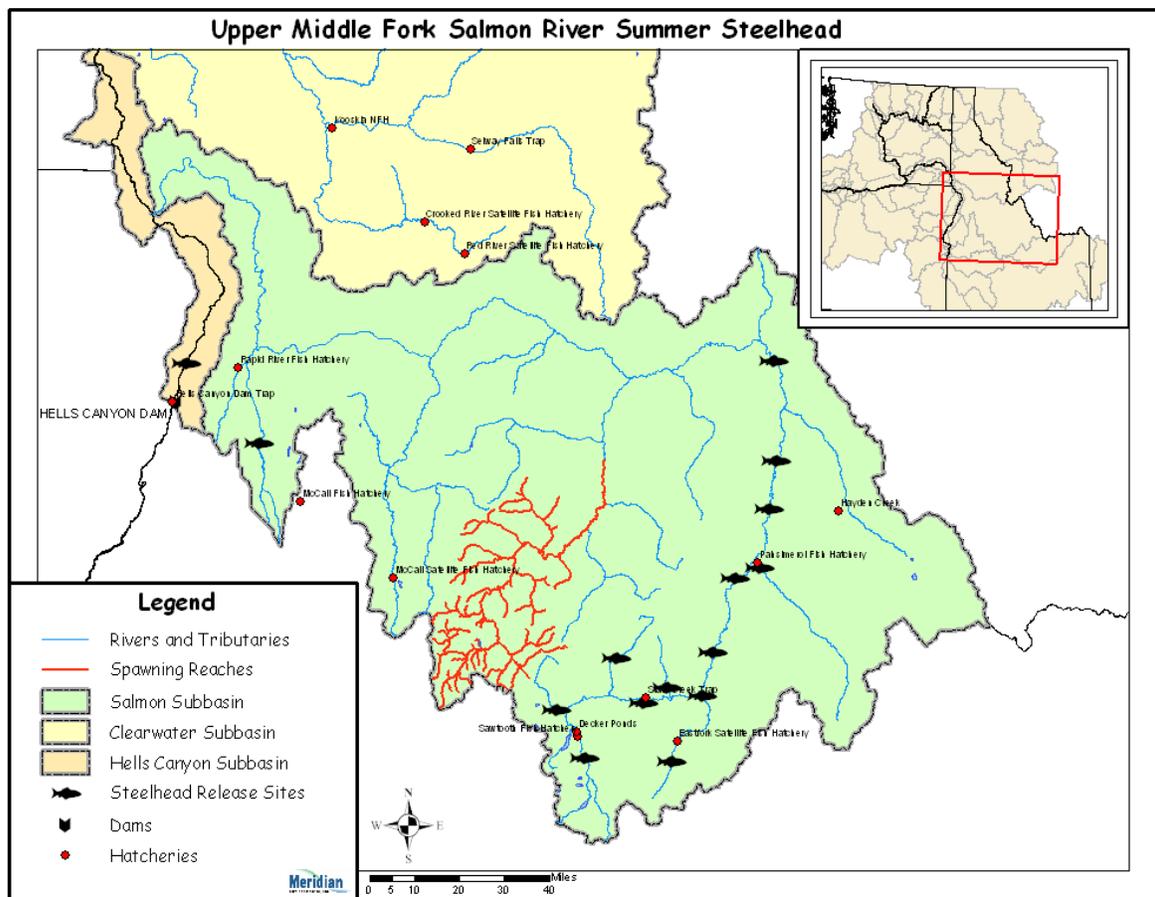
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Salmon South Fork Summer Steelhead B-Run. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 576 | 2.3 | 161 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 593 | 2.4 | 166 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 576 | 2.3 | 161 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 682 | 2.6 | 191 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon River Upper Middle Fork Summer Steelhead B-Run Population and Related Hatchery Programs

January 31, 2009



1 Salmon Upper Middle Fork Summer Steelhead (B-Run)

The Middle Fork Upper Mainstem steelhead population is part of the Snake River Steelhead Distinct Population Segment (DPS). The DPS contains both A and B run steelhead. The Middle Fork Upper Mainstem population is a “B” run and is listed as threatened under the Endangered Species Act. The ICTRT classified this population as “Intermediate”. An “Intermediate” population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.15 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

Historically, it was estimated that over two million steelhead returned to the Columbia River Basin, with about 25% of these originating from the Snake River. Ice Harbor Dam counts indicate that over 100,000 steelhead returned to the Snake River in the early 1960s. There are no reliable estimates of the percentage of fish that have returned historically to the Upper Middle Fork.

2 Current Conditions

This population includes all steelhead spawning in the Upper Middle Fork mainstem and tributaries upstream from Loon Creek. Spawning occurs from mid-March through mid-June. Juveniles emigrate from the system in the spring at ages 1-4, with the majority emigrating at ages 2 and 3.

Current population abundance (number of adults spawning in natural production areas) is unknown. There are no weirs where steelhead escapement can be monitored. Steelhead redds were counted by IDFG from 1988 through 1998 in streams where the population was known to occur. Not all spawning habitat was surveyed during redd counts, so total population counts are not available for any year. From 1990 through 1998, total redds counted each year in the two transects surveyed ranged from 0 to 11. Steelhead parr density in the Upper Middle Fork has generally been less than two age-1 parr per square meter (NPCC 2004).

For extant Snake River steelhead “B” run populations above Lower Granite Dam lacking in direct abundance and productivity data, the ICTRT developed an average dataset to be applied as a surrogate. The dataset was generated using the time series of “B” run natural-origin fish at Lower Granite Dam (TAC report 2002) and dividing by nine (the number of extant “B” run populations above the dam). Abundance for the average “B” run steelhead in recent years has been moderately variable. The most recent 10-year geometric mean number of natural spawners was 272 fish. From 1986-1998, returns per spawner for the average “B” run steelhead dataset ranged from 0.24 (1990) to 6.63 (1998). The most recent 13-year SAR adjusted and delimited geometric mean of returns per spawner was 0.85.

For AHA modeling, IDFG estimated natural-origin fish escapement and adjusted productivity for this population was 758 and 2.04, respectively. Although little data is available, the number of hatchery adults spawning naturally in the basin is assumed to be negligible.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Snake River Steelhead are listed as threatened under ESA.
- Population Description: For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- Recovery Goal for Abundance: The ICTRT defined the Upper Middle Fork Salmon River B-run steelhead population as “Intermediate” and identified a minimum abundance threshold of 1,000 natural-origin adults
- Productivity Improvement Expectation: The ICTRT productivity standard associated with a population defined as “Intermediate” is 1.15.
- Habitat Productivity and Capacity: Productivity: 2.5; Capacity: 1,667

2.2 Current Hatchery Programs Affecting this Population

No hatchery programs are present in this area.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 0 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would be unchanged at 2.0. Average abundance of natural-origin spawners (NOS) would be unchanged at approximately 758 fish. The harvest contribution of the natural and hatchery populations also would be unchanged at approximately 213 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Upper Middle Fork Salmon River B-run steelhead that emphasizes maintaining existing natural spawning populations. Currently this population is operating consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

There are no releases of hatchery-origin steelhead within the Middle Fork Salmon River drainage of the Salmon River Major Population Group.

Recommendations

The HSRG notes that there is a general lack of information related to steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. An effort should be made to improve this information base.

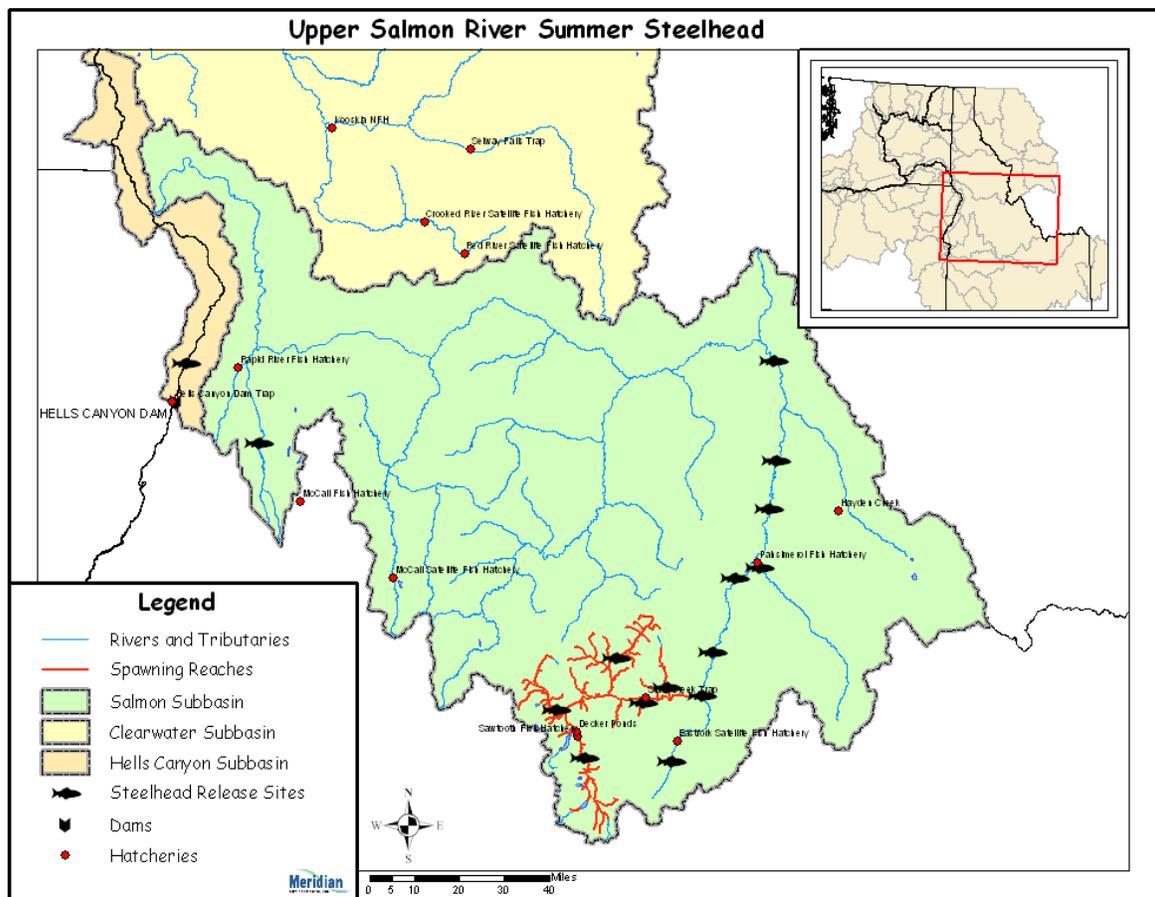
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Salmon Upper Middle Fork Summer Steelhead B-Run. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 758 | 2.0 | 213 | - |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 758 | 2.0 | 213 | - |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 758 | 2.0 | 213 | - |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 911 | 2.2 | 256 | - |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon River Upper Salmon Summer Steelhead A-Run Population and Related Hatchery Programs

January 31, 2009



1 Salmon Upper Salmon Summer Steelhead (A-Run)

The Salmon River Upper Mainstem steelhead population is part of the Snake River Steelhead Distinct Population Segment (DPS). The DPS contains both A and B run steelhead. This population is an “A” run and is classified as threatened under the Endangered Species Act and as “Intermediate” by the ICTRT. An “Intermediate” population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.15 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

Historically, it was estimated that over two million steelhead returned to the Columbia River Basin, with about 25% of these originating from the Snake River. Ice Harbor Dam counts indicate that over a 100,000 steelhead returned to the Snake River in the early 1960s. There are no reliable estimates of the percentage of fish that returned historically to the Upper Salmon River, but it was likely in the thousands.

2 Current Conditions

This population includes the Upper Mainstem Salmon River and its tributaries above the East Fork Salmon River. Primary tributaries include the Yankee Fork Salmon River, Basin Creek, and Valley Creek. Spawning occurs from mid-March through mid-June. Juveniles emigrate from the system in the spring at ages 1-4, with the majority emigrating at ages 2 and 3.

Current abundance (number of adults spawning in natural production areas) is unknown for this population. The only direct count of natural-origin steelhead occurs at the Sawtooth Fish Hatchery weir and represents adults returning to a small proportion of total habitat in the population. The average number of natural-origin returns to the Sawtooth Hatchery weir between 1986 and 2007 was 34 fish.

For Snake River steelhead “A” run populations lacking in direct abundance and productivity data, the ICTRT developed preliminary estimates representing an average population of this run type using Lower Granite Dam natural-origin fish counts. Abundance for the average “A” run steelhead in recent years has been moderately variable. The most recent 10-year geometric mean number of natural spawners was 456 fish. The most recent 13-year SAR adjusted and delimited geometric mean of returns per spawner was 1.69. Steelhead parr density in the upper Salmon River has generally been less than two age-1 parr per square meter from 1991 through 2002 (NPCC 2004).

For AHA modeling, IDFG estimated natural-origin fish escapement and adjusted productivity for the natural-origin A-Run steelhead population was 418 and 0.67, respectively.

Snake River steelhead and indigenous Salmon River steelhead were used to found all hatchery A-run programs in Idaho. The Pahsimeroi Hatchery program was initiated with progeny of adult steelhead trapped at Oxbow and Hells Canyon dams from 1966 through 1968. Returning Snake River stock and some indigenous Salmon River stock were trapped and used as broodstock. The Sawtooth Fish Hatchery broodstock was founded with adults that returned from hatchery-origin smolt releases (e.g., Pahsimeroi Hatchery) and from natural steelhead adults trapped at the facility. Naturally-produced steelhead adults were integrated into the hatchery broodstock until the early 1990s.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- **ESA Status:** Snake River Steelhead are listed as threatened under ESA.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Stabilizing. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Upper Salmon River A-run steelhead population as “Intermediate” and identified a minimum abundance threshold of 1,000 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Intermediate” is 1.15.
- **Habitat Productivity and Capacity:** Productivity: 1.50; Capacity: 1,283

2.2 Current Hatchery Programs Affecting this Population

Four hatchery programs may affect the Upper Salmon River steelhead population. Each is described below.

1. Upper Salmon Summer Steelhead (A-Run Sawtooth/Pahsimeroi-Hatchery). Smolts released to the upper Salmon steelhead population satisfy production as well as supplementation objectives. Planned releases sum to approximately 1.28 million steelhead as described below:

- Upper Salmon River at the Sawtooth weir: 810,000 (100% adipose fin-clipped)
- Valley Creek: 50,000 (no adipose fin- clipping)
- Yankee Fork Salmon River: 330,000 (48% adipose fin-clipped)
- Slate Creek: 100,000 (40% adipose fin-clipped)

Broodstock used to generate smolts for the above releases are collected at the Sawtooth and Pahsimeroi hatcheries. No natural-origin fish are used as broodstock for this program. Spawning and early egg incubation occurs at both hatcheries. Final incubation and all rearing occur at Hagerman National Hatchery and Magic Valley Hatchery. Not all smolts releases in this population area are adipose fin-clipped. Juveniles are transported to release sites in mid-April. The program has an R/S value of 12.6.

2. Shoshone Bannock Tribes Streamside Incubator Program. Approximately 1.0 million eyed steelhead eggs from Sawtooth and Pahsimeroi fish hatcheries are transferred to streamside upwellers where they are incubated on river water to mimic natural hatch timing in the system. Eggs are planted in Yankee Fork, Basin Creek, Morgan Creek, Indian Creek and Panther Creek. The Sawtooth and Pahsimeroi hatcheries share production for this program (approximately 500,000 smolts from each facility).

3. Salmon Upper Salmon Summer Steelhead (B-Run-Dworshak Hatchery). This segregated program releases 250,000 B-Run yearling steelhead to Squaw Creek annually. Broodstock for the program is collected at Dworshak Hatchery on the Clearwater River. Egg incubation and early rearing also occurs at there. Juvenile rearing occurs at the Magic Valley Hatchery. Juveniles are transported and released into Squaw Creek and the Squaw Creek Pond in early April. All juveniles released are 100% adipose fin-clipped. The program has an R/S value of 2.5.

4. Upper Salmon Summer Steelhead (Upper Salmon B-Run Program). This program releases 60,000 yearling steelhead to the Squaw Creek Acclimation Facility annually. This is a segregated program designed to provide fish for harvest in the subbasin. All juveniles released are 100% adipose fin-clipped. Broodstock for the program is collected at the Squaw Creek Acclimation Facility. Adults that meet B-Run criteria are transferred to the East Fork Salmon River Satellite facility for spawning. Early egg incubation occurs at the Sawtooth Fish Hatchery. Final incubation and all rearing occur at the Magic Valley Hatchery. This is essentially a stepping stone program from the Dworshak program. Broodstock adults are either successful F₁ returns from the direct Dworshak smolt program or F₂ adults from locally adapted Squaw Creek (upper Salmon B) returns. This program has an R/S value of 12.6.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0 fish.
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 834 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.7 to 1.3. Average abundance of natural-origin

spawners (NOS) would decrease from approximately 418 fish to approximately 297 fish. The harvest contribution of the natural and hatchery populations would go from approximately 7,495 fish to approximately 43 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Upper Salmon River A-run steelhead that emphasizes maintaining existing natural spawning populations as well as maintaining the current hatchery mitigation program. Currently this population does not meet the HSRG-defined standards for a Primary or Contributing population (pHOS is greater than 0.1).

The upper Salmon River (upstream of the confluence of the Middle Fork Salmon River) is managed primarily for harvest. This strategy is based on the assumption that steelhead were not historically abundant in this part of the Salmon River drainage as they were in the Middle Fork and South Fork Salmon River drainages.

The LSRCP mitigation objective for the Upper Salmon River A-run program is to return 11,660 adults from the Magic Valley Fish Hatchery program and 13,600 adults from the Hagerman National Fish Hatchery program to the project area upstream of Lower Granite Dam. Additionally, the Idaho Power Company objective is to produce 200,000 pounds of steelhead smolts (approximately 900,000 smolts) for release to Salmon River waters. Idaho Power Company production is reared primarily at the Niagara Springs Fish Hatchery. The program is in place to provide terminal harvest opportunities for steelhead. Managers have also identified tribal harvest and augmentation of natural production as objectives in three tributaries within this population zone (Valley Creek, Yankee Fork Salmon River and Slate Creek).

A-run broodstock are trapped at the Sawtooth and Pahsimeroi hatcheries. Spawning and early incubation occurs at both facilities. Final incubation and juvenile rearing occurs at Hagerman National Fish Hatchery and Magic Valley Fish Hatchery.

While production associated with broodstock programs at the Sawtooth and Pahsimeroi hatcheries undergo broad distribution, yearling releases within the upper Salmon steelhead population area include: 810,000 fish to the Salmon River at the Sawtooth Hatchery weir; 50,000 fish to Valley Creek; approximately 300,000 fish to the Yankee Fork Salmon River; and 90,000 fish to Slate Creek. For these releases, no natural-origin adults are incorporated in the spawning design. Not all smolts released within this population area are adipose fin-clipped.

The adult weir at the Sawtooth Hatchery is very effective at removing hatchery-origin adults.

The Sawtooth Hatchery also produces approximately 500,000 eyed-eggs for the Shoshone-Bannock Tribes' streamside program. Eggs are placed in streamside incubation devices in the Yankee Fork Salmon River and Basin Creek.

Two B-run steelhead programs also operate within the boundaries of this population. The Upper Salmon Summer Steelhead (B-Run-Dworshak Hatchery) program sources eggs from Dworshak National Fish Hatchery. This program releases approximately 250,000 Magic Valley Hatchery-reared smolts annually to the Squaw Creek/Pond complex. Adults that return to the terminal area are collected at the adult weir on Squaw Creek and incorporated in the upper Salmon B-program. The Upper Salmon Summer Steelhead (Upper Salmon B-Run) program produces approximately 60,000 smolts from locally adapted adults. Broodstock are either first generation adults from the Dworshak program or second generation adults from the upper Salmon River B-program. Production is occasionally higher depending on adult returns. Smolts are reared at the Magic Valley Hatchery and released to the Squaw Creek/Pond complex. Upper Salmon River B-run smolts are differentially marked from first generation Dworshak smolts. Upper Salmon River-B adults return at a higher rate than Dworshak-origin B adults (e.g., approximately three times greater).

The composition of spawners in the habitat is largely unknown within this population zone.

Adult collection efficiency at Squaw Creek is limited by facility and environmental conditions. This is preventing the transition to a locally-derived B-run from the Salmon River.

Recommendations

The HSRG recommends that the practice of importing first generation smolts of Dworshak Hatchery-origin be transitioned to a program that uses locally adapted broodstock. To accelerate this transition and provide broodstock, the HSRG recommends that (1) production originating from the locally adapted upper Salmon River broodstock be released with adipose fins intact (to increase adult returns to the terminal facility), and (2) the program be relocated to a facility with high adult collection efficiency until alternative facilities can be developed. The HSRG recommends that this locally adapted B-run broodstock be the source of all releases in the upper Salmon River subbasin.

The HSRG has no specific recommendations for programs operated in the Yankee Fork Salmon River, Valley Creek and upper Salmon River at the Sawtooth Hatchery.

The HSRG notes that there is a general lack of information related to steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. An effort should be made to improve this information base.

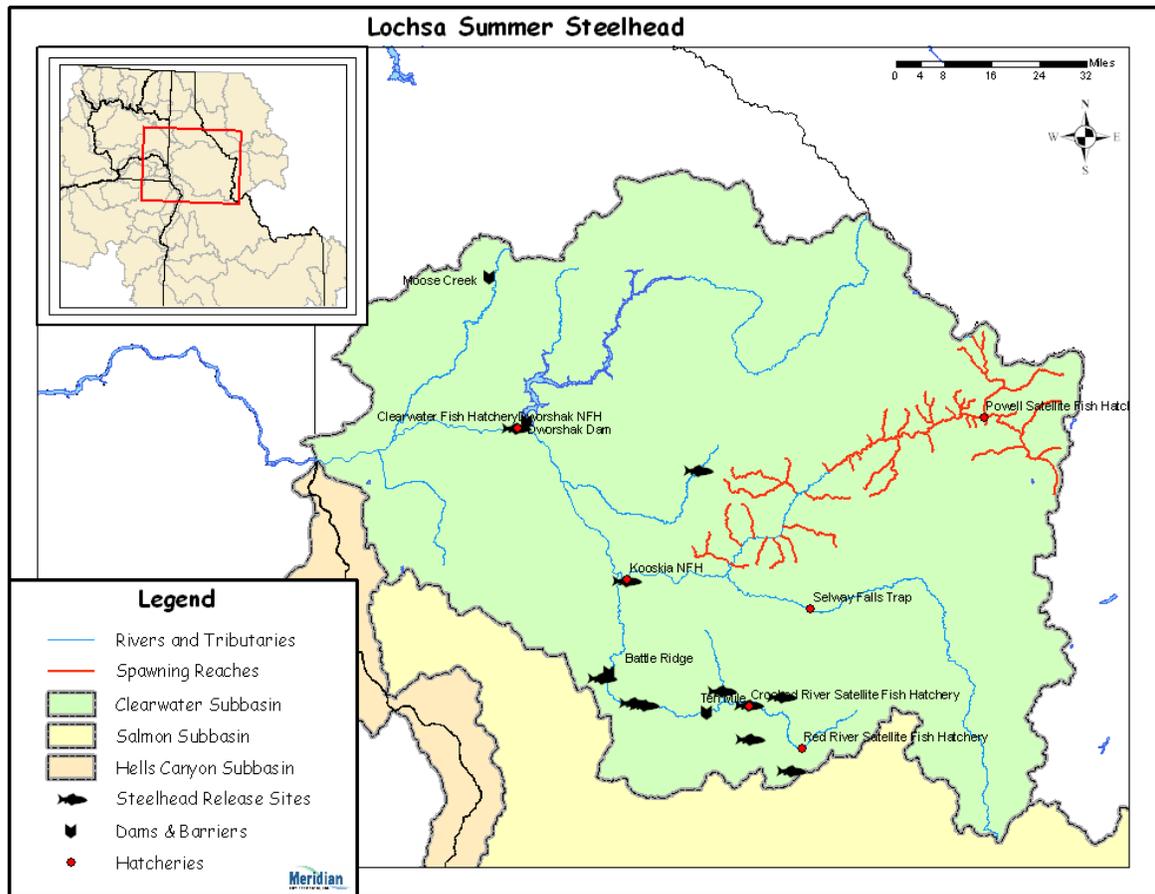
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Upper Salmon Summer Steelhead A-Run. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|--|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 34% | 0.00 | 418 | 0.7 | 61 | 0 |
| | A-Run Sawtooth- Pahsimeroi Seg Harv | 1,284.6 | 70% | | | | | | 6,813 | 2,684 |
| | B-Run Upper Salmon Seg Harv | 59.2 | 25% | | | | | | 261 | 6 |
| | B-Run Dworshak Seg Harv | 250.3 | 25% | | | | | | 360 | 43 |
| No Hatchery | None None | - | 0% | 25% | 0% | 1.00 | 297 | 1.3 | 43 | - |
| HSRG Solution | None None | - | 0% | 25% | 34% | 0.00 | 420 | 0.7 | 61 | 0 |
| | A-Run Sawtooth- Pahsimeroi Seg Harv | 1,284.6 | 70% | | | | | | 6,813 | 2,684 |
| | B-Run Upper Salmon Seg Harv | 134.6 | 25% | | | | | | 192 | 24 |
| | B-Run Upper Salmon R Seg Harv | 250.3 | 25% | | | | | | 360 | 43 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 25% | 31% | 0.00 | 473 | 0.7 | 69 | 0 |
| | A-Run Sawtooth- Pahsimeroi Seg Harv | 1,284.6 | 70% | | | | | | 6,813 | 2,684 |
| | B-Run Upper Salmon Seg Harv | 134.6 | 25% | | | | | | 192 | 24 |
| | B-Run Upper Salmon R Seg Harv | 250.3 | 25% | | | | | | 360 | 43 |

Hatchery Scientific Review Group Review and Recommendations

Lochsa Summer Steelhead (B-run) Population and Related Hatchery Programs

January 31, 2009



1 Lochsa Summer Steelhead (B-run)

The Lochsa River steelhead population is part of the Snake River Basin Steelhead Distinct Population Segment (DPS) that includes all naturally spawned populations of steelhead in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (62 FR 43937; August 18, 1997). Several artificial propagation programs are considered part of the DPS: the Tucannon River natural stock, the North Fork Clearwater River stock reared at Dworshak National Fish Hatchery (NFH) and Clearwater Fish Hatchery reared and released in the Clearwater and Salmon rivers¹, East Fork Salmon River local stock, and the Little Sheep Creek/Imnaha River Hatchery steelhead hatchery programs. The DPS was listed as a threatened under the ESA on August 18, 1997; this status was reaffirmed on January 5, 2006.

The DPS has six major population groupings (MPGs): Lower Snake River, Clearwater River, Grande Ronde River, Salmon River, Hells Canyon, and the Imnaha River (ICTRT 2006), and contains both A and B-run steelhead (based on migration timing, ocean-age and adult size). The Lochsa River population is a natural B-run population and is included in the Clearwater River MPG. The population is found in the mainstem Lochsa River and all tributaries. Like all populations in the MPG, Lochsa steelhead occupy areas upstream from the historical Lewiston Dam, which was in place from 1927 to 1973. The dam was fitted with a fish ladder, but it provided only marginal passage for migrating steelhead adults and smolts (Cramer et al. 1998). Unlike Chinook salmon, steelhead were able to maintain some access to the Clearwater River subbasin during the dam's existence and so have been included in the DPS. Lewiston Dam was thought to be a partial barrier to adult steelhead migration, reducing escapement to upstream reaches.

The Interior Columbia Technical Recovery Team (ICTRT) classified the Lochsa River population as an "Intermediate" population based on historical habitat potential. An "Intermediate" population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.30 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

According to the Draft Snake River Steelhead Recovery Plan, Snake River steelhead enter fresh water from June to October and spawn the following spring from March to June. Emergence occurs by early June in low elevation streams and as late as mid-July at higher elevations. Snake River steelhead usually smolt at age-2 or age-3 years and reside in marine waters for 1 to 3 years prior to returning to their natal stream to spawn at 4 or 5 years of age.

There are no estimates of historical steelhead run sizes in the Lochsa River.

2 Current Conditions

Steelhead spawning has been observed in the upper mainstem Lochsa River and in several tributaries. The ICTRT defined seven major spawning areas (Crooked Fork Creek, White Sands Creek, Boulder Creek, Fish Lake, Fish Creek, Warm Springs Creek, and the lower Lochsa River). High spring flows usually prevent documentation of spawning in most streams. Juvenile steelhead rearing has been documented in most of the Lochsa River drainage that is accessible to adult migration.

¹ Artificial propagation programs for steelhead in the Clearwater River subbasin are based on the North Fork Clearwater stock which was trapped at the foot of Dworshak Dam when access to the North Fork was blocked in 1969.

Current natural abundance (number of adults spawning in natural production areas) is unknown for this population. While the aggregate B-run abundance for the DPS can be quantified based on counts at Lower Granite Dam, it is extremely difficult to census abundance at the population level. The ICTRT developed a generic dataset for B-run steelhead populations to be used for a preliminary assessment of abundance productivity risk. The dataset was derived by distributing the natural-origin steelhead counted annually at Lower Granite Dam equally across the nine extant B-run populations. Abundance for the generic “B” run steelhead in recent years has been moderately variable. The most recent 10-year geometric mean number of natural spawners was 272 fish. From 1986 to 1998, returns per spawner for the generic “B” run steelhead dataset ranged from 0.24 (1990) to 6.63 (1998). The most recent 13-year SAR adjusted and delimited geometric mean of returns per spawner was 0.85.

For AHA modeling, IDFG estimated natural-origin fish escapement and adjusted productivity for this population to be 777 and 1.75, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Lochsa River steelhead population.

- **ESA Status:** The Snake River Basin steelhead DPS was listed as threatened on August 18, 1997; the threatened status was reaffirmed on January 5, 2006.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Lochsa River B-run steelhead population as “Intermediate” and identified a minimum abundance threshold of 1,000 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Intermediate” is 1.15.
- **Habitat Productivity and Capacity:** Productivity: 2.5, Capacity: 2,000.

2.2 Current Hatchery Programs Affecting this Population

Currently there are no hatchery programs for steelhead in the Lochsa River and the occurrence of adult hatchery fish in the population is unknown. Hatchery-origin steelhead could have returned to various tributaries within the population from fry releases made from 1973 through 1982. Hatchery steelhead fry were released in eight of the ten years during that period (a total of 5.93 million fry). Adult steelhead were also released into the Lochsa River in 1973, 1979 and 1990. In 1981, adults were released into Post Office Creek and Squaw Creek. There is no documentation of any releases after 1990. All releases are presumed to have been Dworshak NFH B-run stock (ICTRT 2005). The occurrence of adult hatchery fish in the current population is unknown; however, hatchery-origin steelhead are rarely observed in the important production areas in the Lochsa and Selway rivers or in the lower Clearwater River tributaries. They are not believed to influence the natural populations.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 46 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.8 to 2.0. Average abundance of natural-origin spawners (NOS) would increase from approximately 776 fish to approximately 909 fish. The harvest contribution of the natural and hatchery populations would go from approximately 218 fish to approximately 255 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Lochsa River B-run steelhead that emphasizes maintaining existing natural spawning populations. Currently this population is operating consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

There are no releases of hatchery-origin steelhead within the Lochsa River and Selway River drainages of the Clearwater River Major Population Group.

Recommendations

The HSRG notes that there is a general lack of information about steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. An effort should be made to improve this information base.

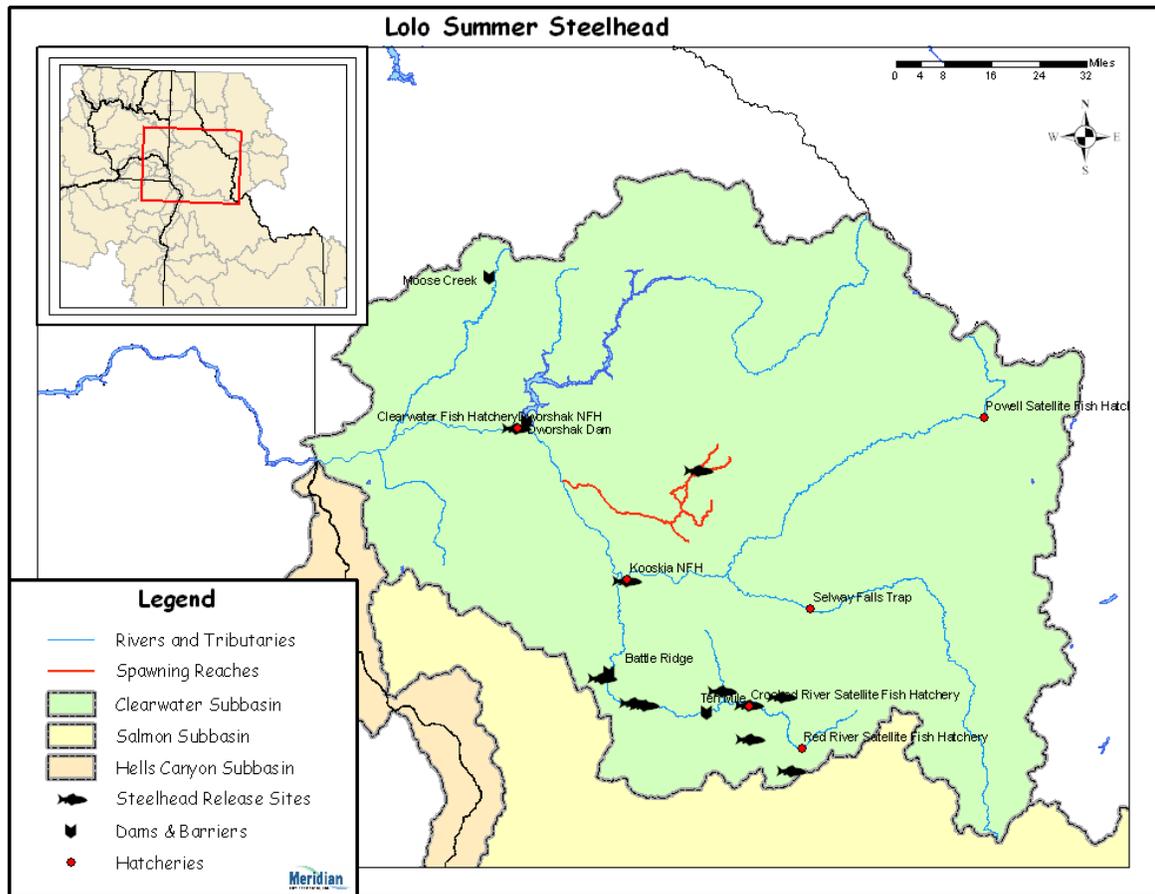
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Lochsa River Summer Steelhead (B-run). The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 776 | 1.8 | 218 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 0.00 | 909 | 2.0 | 255 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 797 | 1.8 | 224 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 1,176 | 2.5 | 330 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Lolo Summer Steelhead (A+B-run) Population and Related Hatchery Programs

January 31, 2009



1 Lolo Summer Steelhead (A+B-run)

The Lolo Creek steelhead population is part of the Snake River Basin Steelhead Distinct Population Segment (DPS) that includes all naturally-spawned populations of steelhead in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (62 FR 43937; August 18, 1997). Several artificial propagation programs are considered part of the DPS: the Tucannon River natural stock, the North Fork Clearwater River stock reared at Dworshak National Fish Hatchery and Clearwater Fish Hatchery and released in the Clearwater and Salmon rivers¹, East Fork Salmon River local stock, and the Little Sheep Creek/Imnaha River Hatchery steelhead programs. The DPS was listed as a threatened under the ESA on August 18, 1997; this status was reaffirmed on January 5, 2006.

The DPS has six major population groupings (MPGs): Lower Snake River, Clearwater River, Grande Ronde River, Salmon River, Hells Canyon, and the Imnaha River (ICTRT 2006), and contains both A and B-run steelhead (based on migration timing, ocean-age and adult size). The Lolo Creek population contains both A-run and B-run adult life history types and is included in the Clearwater River MPG. Like all populations in the MPG, the Lolo Creek population occupies areas upstream from the historical Lewiston Dam, which was in place from 1927 to 1973. Although the dam was fitted with a fish ladder, it provided only marginal passage for migrating steelhead adults and smolts (Cramer et al. 1998). Unlike Chinook salmon, steelhead were able to maintain access to the Clearwater River subbasin during the dam's existence; therefore they are included in the DPS.

A steep-gradient narrow canyon approximately 15 miles upstream of the mouth of Lolo Creek separates the upper and lower production areas. The lower production area is thought to be used by A-run fish and the upper area by B-run fish.

The Interior Columbia Technical Recovery Team (ICTRT) classified the Lolo Creek population as a "Basic" population based on historical habitat potential (ICTRT 2005). A "Basic" population is one that requires a minimum abundance of 500 natural spawners and an intrinsic productivity greater than 1.15 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

According to the Draft Snake River Steelhead Recovery Plan, Snake River Basin steelhead trout enter fresh water from June to October and spawn during the following spring from March to May. Emergence occurs by early June in low elevation streams and as late as mid-July at higher elevations. Snake River steelhead usually smolt at age-2 or age-3 years and reside in marine waters for 1 to 3 years prior to returning to their natal stream to spawn at 4 or 5 years of age.

There are no estimates of historical steelhead abundance in Lolo Creek.

2 Current Conditions

Steelhead spawn in the mainstem of Lolo Creek (from Musselshell Creek to Yoosa Creek) and in any accessible tributaries in upper Lolo Creek drainage, and Yoosa Creek drainage. Some limited spawning may also occur in the Musselshell Creek and Eldorado Creek drainages (USFS 2006). Although current natural abundance (number of adults

¹ Artificial propagation programs for steelhead in the Clearwater River subbasin are based on the North Fork Clearwater stock trapped at the base of Dworshak Dam when its construction blocked access to the North Fork in 1969.

spawning in natural production areas) is unknown for this population, the number of natural-origin steelhead adults migrating and spawning within the Lolo Creek drainage is considered very low (USFS 2006).

In response to this lack of abundance data, the ICTRT developed a generic dataset for B-run steelhead populations to be used for a preliminary assessment of abundance productivity risk (ICTRT 2005). The dataset was derived by distributing the natural-origin steelhead counted annually at Lower Granite Dam equally across the nine extant B-run populations found above the dam. Abundance for the generic B-run steelhead in recent years has been moderately variable; the most recent 10-year geometric mean number of natural spawners was 272 fish. From 1986-1998, returns per spawner for the generic “B” run steelhead dataset ranged from 0.24 (1990) to 6.63 (1998). The most recent 13-year SAR adjusted and delimited geometric mean of returns per spawner was 0.85. The A-run component of this population was not included in the generic abundance/productivity risk assessment. The population is predominantly sustained by B-run production; A-run fish are believed to occupy only the lower 10 to 15 miles of Lolo Creek.

For AHA modeling, IDFG estimated natural-origin fish escapement and adjusted productivity for this population to be 92 and 0.89, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Lolo Creek steelhead population.

- **ESA Status:** The Snake River Basin steelhead DPS was listed as threatened on August 18, 1997; the threatened status was reaffirmed on January 5, 2006.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Contributing. The population currently meets the broodstock criteria for a Stabilizing population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Lolo Creek A/B-run steelhead population as “Basic” and identified a minimum abundance threshold of 500 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Basic” is 1.30.
- **Habitat Productivity and Capacity:** Productivity: 2.0; Capacity: 200.

2.2 Current Hatchery Programs Affecting this Population

Artificial propagation programs for steelhead in the Clearwater River subbasin are based on the North Fork Clearwater B-run stock that was trapped at the base of Dworshak Dam when the dam was constructed on the North Fork in 1969. This stock has been outplanted into the Lolo Creek population intermittently since 1977. Fry were released for six years (1977-1983), fingerlings for five years (1985-1991), smolts for six years (1989-2005) and adults for six years (1978-2002). Annual releases have ranged from 40,000 to 625,000 fry, 11,000 to 202,000 fingerlings, 18,000 to 53,000 smolts and 150 to 1,150 adults (ICTRT 2005).

Currently, a Lolo Creek supplementation program operates out of the Clearwater Hatchery using Dworshak NFH B-run steelhead stock. The release goal for this program is 50,000 smolts. Fish are released at approximately 4.5 fish per pound and all smolts are

unmarked with the exception of a PIT-tag group of 1,000 fish. Broodstock is collected at the Dworshak NFH and all juveniles are reared at the Clearwater Hatchery. No natural-origin adults are spawned. The program has an R/S for of 35.0.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 628
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 141

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008). Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.9 to 1.8. Average abundance of natural-origin spawners (NOS) would increase from approximately 92 fish to approximately 85 fish. The harvest contribution of the natural and hatchery populations would go from approximately 115 fish to approximately 12 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a

solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Lolo Creek A/B-run steelhead that emphasizes maintaining existing natural spawning populations and using hatchery-origin steelhead in an attempt to augment natural production. Currently, this population is not consistent with the HSRG-defined standards for either a Primary or Contributing population designation (pHOS exceeds 0.10).

As currently operated, approximately 50,000 Dworshak National Fish Hatchery smolts are outplanted in Lolo Creek annually. Of these, all are released with adipose fins intact.

The HSRG observes that population capacity and productivity in this basin appears to be very limited. This makes achieving the manager's conservation goals very difficult.

The HSRG also notes that there is a general lack of information related to steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas.

Recommendations

Given the small capacity and low productivity of this population, the HSRG was unable to develop a solution that would achieve the HSRG-defined standards of a Primary population. The low capacity of the population used in our evaluation will allow only an integrated hatchery program up to the current size of 50,000 smolts. At this size, the program would be consistent with HSRG-defined standards for a Contributing population. It also appears that achieving the basic population level defined by the TRT will not be possible without significant improvements in habitat and passage.

The HSRG recommends terminating the use of Dworshak B-run steelhead for the Lolo Creek program. The HSRG recommends developing an integrated conservation program with natural-origin returns to Lolo Creek.

The managers should coordinate the programming of all salmon populations reared in the Clearwater Fish Hatchery, Dworshak National Fish Hatchery, Kooskia National Fish Hatchery and Nez Perce Tribal Hatchery to maximize the benefits of available water supply, appropriate water temperature, and rearing containers. Operating these four major hatcheries as a coordinated system would facilitate the movement of programs/populations between and among the different hatcheries. This would maximize survival by producing fish in good condition for release at the appropriate life stage.

An effort should be made to improve the information base about this population and a more refined analysis of habitat capacity and productivity needs to be done. This improved information base will be important to determining what combination of habitat and hatchery programs will be the most effective in this basin.

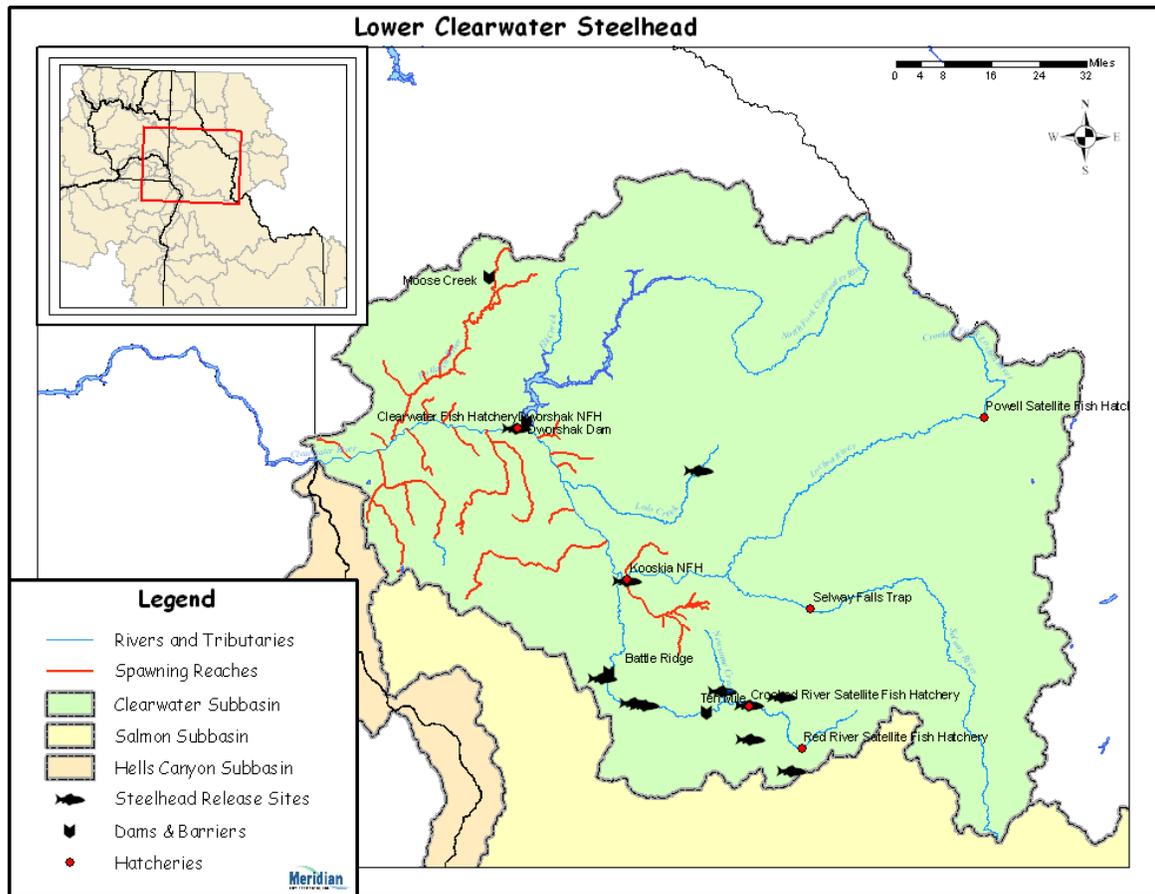
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Lolo Creek Summer Steelhead (A- and B-run). The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 49.7 | 10% | 0% | 68% | 0.00 | 92 | 0.9 | 115 | 70 |
| | | | | | | | | | | |
| No Hatchery | Int Cons | | | 0% | | 1.00 | 85 | 1.8 | 12 | - |
| | | | | | | | | | | |
| HSRG Solution | Int Cons | 49.4 | 0% | 0% | 83% | 0.55 | 124 | 1.3 | 122 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int Cons | 49.4 | 0% | 0% | 81% | 0.55 | 140 | 1.4 | 124 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Lower Clearwater Summer Steelhead (A-run) (Potlatch) Population and Related Hatchery Programs

January 31, 2009



1 Lower Clearwater Summer Steelhead (A-run)

The Lower Clearwater mainstem steelhead population is part of the Snake River Basin Steelhead Distinct Population Segment (DPS) that includes all naturally-spawned populations in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (62 FR 43937; August 18, 1997). Several artificial propagation programs are considered part of the DPS: the Tucannon River natural stock, the North Fork Clearwater River stock reared at Dworshak National Fish Hatchery (NFH) and Clearwater Fish Hatchery and released in the Clearwater and Salmon Rivers¹, East Fork Salmon River local stock, and the Little Sheep Creek/Imnaha River Hatchery steelhead hatchery programs. The DPS was listed as a threatened under the ESA on August 18, 1997; this status was reaffirmed on January 5, 2006.

The DPS has six major population groupings (MPGs): Lower Snake River, Clearwater River, Grande Ronde River, Salmon River, Hells Canyon, and the Imnaha River (ICTRT 2006), and contains both A and B-run steelhead (based on migration timing, ocean-age and adult size). The Lower Clearwater population is an A-run (natural population) and is part of the Clearwater River MPG. The population is found in the South Fork Clearwater and its tributaries downstream of Mill Creek, the Middle Fork Clearwater and its tributaries, and the mainstem Clearwater and tributaries (with the exception of the North Fork Clearwater) downstream to the confluence with the Snake River. Like all populations in the MPG, the Lower Clearwater population occupies areas upstream from the historical Lewiston Dam, which was in place from 1927 to 1973. Although the dam was fitted with a fish ladder, it provided only marginal passage for migrating steelhead adults and smolts (Cramer et al. 1998). Unlike Chinook salmon, steelhead were able to maintain access to the Clearwater River subbasin during the dam's existence, and therefore are included in the DPS. The Lower Clearwater mainstem population resides in the lower portions of the Middle and South Fork Clearwater rivers and their tributaries. A break in habitat characteristics separates it from the North Fork.

The Interior Columbia Technical Recovery Team (ICTRT) classifies Lower Clearwater summer steelhead as a "Large" population based on historical habitat potential (ICTRT 2005). A "Large" population is one that requires a minimum abundance of 1,500 natural spawners and an intrinsic productivity greater than 1.1 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

According to the Draft Snake River Steelhead Recovery Plan, Snake River Basin steelhead trout enter fresh water from June to October and spawn during the following spring from March to May. Emergence occurs by early June in low elevation streams and as late as mid-July at higher elevations. Snake River steelhead usually smolt at age-2 or age-3 years and reside in marine waters for 1 to 3 years prior to returning to their natal stream to spawn at 4 or 5 years of age.

There are no estimates of historical steelhead abundance in the lower Clearwater River.

¹ Artificial propagation programs for steelhead in the Clearwater River Basin are based on the North Fork Clearwater stock, trapped at the base of Dworshak Dam when dam construction blocked access to the North Fork in 1969.

2 Current Conditions

The Lower Mainstem Clearwater Steelhead population has five major spawning areas: Big Canyon Creek, Clear Creek, Lapwai Creek, Lawyer Creek, and the Upper Potlatch River).

Current natural population abundance (number of adults spawning in natural production areas) is unknown because there are no methods (weirs, traps, etc.) or surveys to enumerate adults. Surveys of juvenile density or abundance are conducted in some stream reaches. Fish densities are generally low throughout this population, except for a few areas where streams are fed by perennial groundwater sources. Large numbers of hatchery-origin steelhead pass through the population in the mainstem Clearwater River, both as juveniles and adults. Those fish originate from hatchery programs upstream of the population. It is unknown how many downstream migrating juvenile steelhead cease their migration and become freshwater residents in the population, or how many upstream migrating adults stop short of their release locations and spawn in the population.

For AHA modeling, IDFG estimated natural-origin fish escapement and adjusted productivity for this population was 983 and 3.68, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Lower Clearwater River steelhead population.

- **ESA Status:** The Snake River basin steelhead DPS was listed as threatened on August 18, 1997; the threatened status was reaffirmed on January 5, 2006.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Lolo Creek A-run steelhead population as “Large” and identified a minimum abundance threshold of 1,500 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Large” is 1.1.
- **Habitat Productivity and Capacity:** Productivity: 5.21; Capacity: 1,430

2.2 Current Hatchery Programs Affecting this Population

The Dworshak NFH operates a segregated (harvest) steelhead program in Clear Creek (Middle Fork Clearwater River). The Kooskia NFH was constructed on Clear Creek as a spring Chinook mitigation program. An adult weir at Kooskia NFH operates in March and April to collect and enumerate steelhead. Hatchery-origin adults are outplanted in areas identified by the Nez Perce Tribe, while natural-origin adults are passed upstream of the hatchery weir. The program releases approximately 300,000 smolts into Clear Creek on the Middle Fork Clearwater River. All smolts are adipose fin-clipped and derived from B-run broodstock collected at Dworshak NFH. Approximately 5,000 smolts are fitted with PIT-tags. Natural-origin broodstock is not used in this segregated program. According to the ICTRT, the Lower Clearwater A-run population exhibits no evidence of hatchery influence on their genetic composition. Other hatchery programs operating in Lolo Creek and the South Fork Clearwater River produce juveniles and

adults that travel through the lower Clearwater River population zone. This program has an R/S of 35.0.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 88 fish

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 3.9 to 4.6. Average abundance of natural-origin spawners (NOS) would increase from approximately 983 fish to approximately 1,115 fish. The harvest contribution of the natural and hatchery populations would go from approximately 3,469 fish to approximately 162 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Lower Clearwater River A-run steelhead that emphasizes maintaining existing natural spawning populations. Currently, this population is consistent with the HSRG-defined standards for Primary population designation (pHOS less than 0.05).

The Dworshak National Fish Hatchery releases approximately 300,000 B-run steelhead in the Lower Clearwater River population area. Fish are 100% adipose-fin clipped and a portion PIT-tagged for evaluation purposes. This is a segregated harvest program with no natural-origin fish in the broodstock. Smolts are released downstream of the Kooskia National Fish Hatchery. An adult weir is operated in March and April at the Kooskia facility. Natural-origin steelhead are passed upstream of the Kooskia weir into Clear Creek while hatchery-origin adults are transferred to the Nez Perce Tribe for outplanting. Broodstock for this program is collected at the Dworshak National Fish Hatchery. Incubation and rearing to release occur at Dworshak.

There is little information on hatchery straying; however, monitoring in the Potlatch River has identified less than 2% hatchery fish. The HSRG has no information to suggest that “up-river” B-run hatchery programs are significantly impacting Lower Clearwater River A-run steelhead populations.

Recommendations

Managers could consider the benefits and disadvantages of developing a locally derived broodstock for the Kooskia release. Additionally, the HSRG recommends that managers discontinue outplanting hatchery adults collected at this facility in other waters that support natural spawning.

The managers should coordinate the programming of all salmon populations reared in the Clearwater Fish Hatchery, Dworshak National Fish Hatchery, Kooskia National Fish Hatchery and Nez Perce Tribal Hatchery to maximize the benefits of available water supply, appropriate water temperature, and rearing containers. Operating these four major hatcheries as a coordinated system would facilitate the movement of programs/populations between and among the different hatcheries. This would maximize survival by producing fish in good condition for release at the appropriate life stage.

The HSRG notes that there is a general lack of information about steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. An effort should be made to improve this information base.

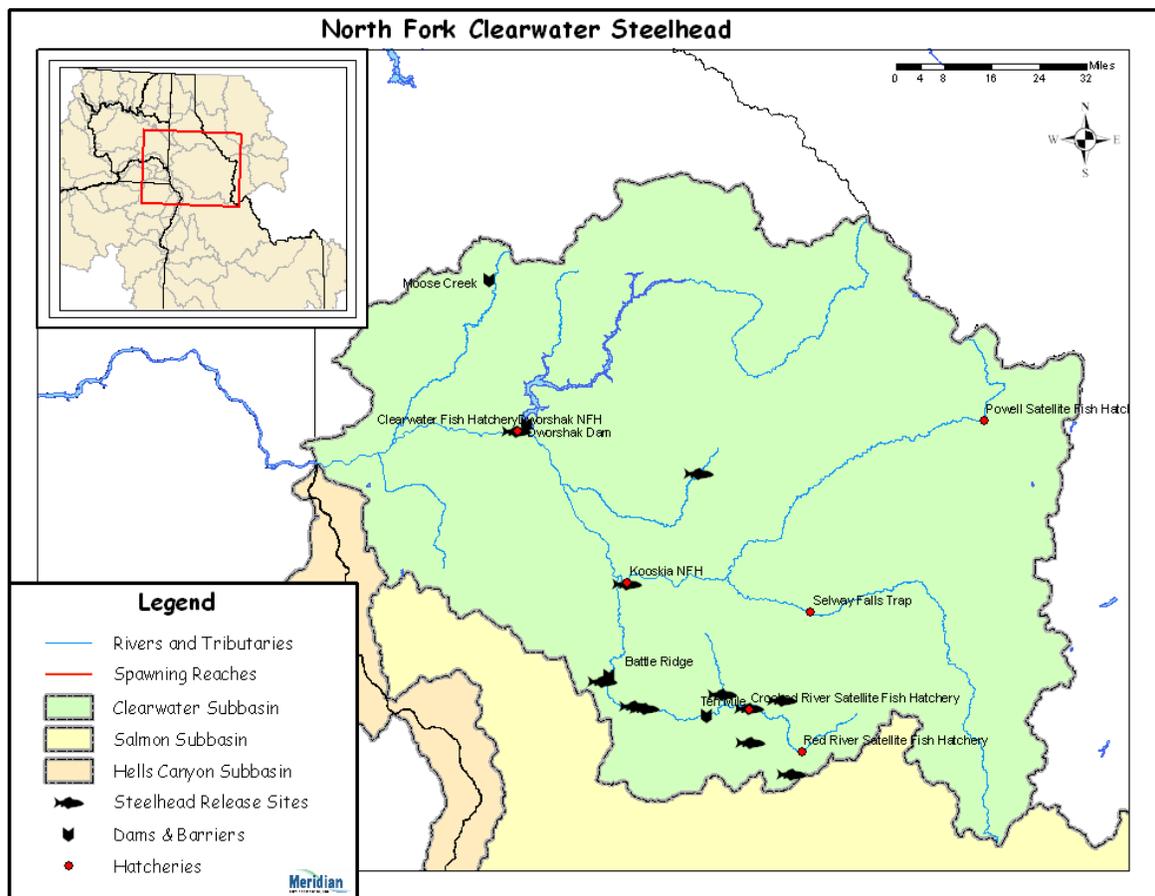
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Lower Clearwater Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-------------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 2% | 0.00 | 983 | 3.9 | 143 | 0 |
| | B-Run Clear Cr Seg Harv | 298.0 | 10% | | | | | | 3,326 | 158 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,115 | 4.6 | 162 | - |
| HSRG Solution | None None | - | 0% | 0% | 2% | 0.00 | 1,000 | 4.0 | 145 | 0 |
| | B-Run Clear Cr Seg Harv | 298.0 | 20% | | | | | | 3,326 | 197 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 2% | 0.00 | 1,139 | 4.4 | 166 | 0 |
| | B-Run Clear Cr Seg Harv | 298.0 | 10% | | | | | | 3,326 | 158 |

Hatchery Scientific Review Group Review and Recommendations

North Fork Clearwater Summer Steelhead (B-run) (Dworshak National Fish Hatchery) Population and Related Hatchery Programs

January 31, 2009



1 North Fork Clearwater Summer Steelhead (B-run)

The North Fork Clearwater steelhead population is part of the Snake River Basin Steelhead Distinct Population Segment (DPS) that includes all naturally-spawned populations in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (62 FR 43937; August 18, 1997). Several artificial propagation programs are considered part of the DPS: the Tucannon River natural stock, the North Fork Clearwater River stock reared at Dworshak National Fish Hatchery (NFH) and Clearwater Fish Hatchery and released in the Clearwater and Salmon Rivers¹, East Fork Salmon River local stock, and the Little Sheep Creek/Imnaha River Hatchery steelhead programs. The DPS was listed as a threatened under the ESA on August 18, 1997; this status was reaffirmed on January 5, 2006.

The DPS has six major population groupings (MPGs): Lower Snake River, Clearwater River, Grande Ronde River, Salmon River, Hells Canyon, and the Imnaha River (ICTRT 2006), and contains both A and B-run steelhead (based on migration timing, ocean-age and adult size). The North Fork Clearwater population (B-run) was blocked by the construction of Dworshak Dam in 1969, and currently is maintained only as a hatchery population. According to the ICTRT, the current Dworshak NFH B-run steelhead stock represents the historic North Fork Clearwater River population.

The ICTRT classified the North Fork Clearwater population as “Large.” A “Large” population is one that requires a minimum abundance of 1,500 natural spawners. However, the ICTRT also classified the North Fork Clearwater population as Extirpated.

There are no estimates of historical steelhead abundance in the North Fork Clearwater River.

2 Current Conditions

A segregated hatchery program is operated at the Dworshak NFH. Between 2000-2001 and 2005-2006, an average of 28,313 hatchery steelhead returned to the Clearwater River basin annually. Approximately 75% of these fish contributed to the sport harvest, 4% contributed to the Tribal harvest, 18% returned to the Dworshak NFH and 2% remained unharvested (Burge et al. 2004). Adult hatchery steelhead collected in excess of broodstock requirements are typically recycled to the lower Clearwater River for additional harvest opportunities or are added to the Tribal harvest. Currently, all wild fish collected at the hatchery are immediately transported and released upstream in the mainstem Clearwater just above Dworshak NFH. From 1980 through 2004, the smolt to adult survival of the population (as measured from hatchery rack returns) ranged from 0.11 to 0.88%. The mean hatchery rack return rate for 1993 through 2002 was 0.37% (Burge et al. 2004).

Due to its extirpated status and lack of usable spawning habitat (downstream of Dworshak Dam), natural-origin fish escapement and adjusted productivity for this population were not estimated (e.g., set at zero).

¹ Artificial propagation programs for steelhead in the Clearwater River subbasin are based on the North Fork Clearwater stock trapped at the base of Dworshak Dam when the dam blocked access to the North Fork in 1969.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the North Fork Clearwater River steelhead population.

- **ESA Status:** The Snake River Basin steelhead DPS was listed as threatened on August 18, 1997; the threatened status was reaffirmed on January 5, 2006.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Stabilizing.
- **Recovery Goal for Abundance:** Population is extirpated. No abundance goal was developed.
- **Productivity Improvement Expectation:** NA
- **Habitat Productivity and Capacity:** Productivity: NA (blocked by Dworshak Dam), Capacity: NA (blocked by Dworshak Dam)

2.2 Current Hatchery Programs Affecting this Population

The Dworshak NFH operates a segregated (harvest) steelhead program in the North Fork Clearwater River. The program releases approximately 1.2 million smolts (6 fpp) directly into the mouth of the North Fork at the hatchery. All smolts are adipose fin-clipped and derived from B-run broodstock collected at Dworshak. Natural-origin fish are not used in harvest mitigation broodstock. The program has an R/S of 35.0.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: NA

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis indicates that this population is entirely hatchery supported and would not be sustained without the hatchery. No natural, reproducing population exists in the habitat available downstream of Dworshak Dam and upstream of the confluence with the mainstem Clearwater River.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for the North Fork Clearwater River that emphasizes maintaining existing hatchery programs. Currently, this population is not consistent with the HSRG-defined standards for either a Primary or Contributing population designation (pHOS exceeds 0.10).

Only about 1.5 miles of the North Fork Clearwater River remains downstream of Dworshak Reservoir. As mitigation for the construction of the dam and the extirpation of B-run steelhead in this river, the Dworshak National Fish Hatchery was constructed in 1969. The hatchery releases approximately 1.2 million steelhead annually into the North Fork Clearwater River. All fish are adipose fin-clipped and a portion are coded wire-tagged (150,000 smolts currently) and PIT-tagged (20,000 smolts currently). Broodstock composition is 100% hatchery-origin. No steelhead spawning habitat remains in the 1.5-mile reach below the dam.

Most of the water supply for this hatchery is pumped from the North Fork Clearwater River near the adult collection intake, which has resulted in reoccurring disease problems at the facility.

Monitoring of straying is very limited; however, trapping in Fish Creek in the lower Lochsa indicates few hatchery fish straying into this location.

Recommendations

The HSRG recommends that managers develop an improved water supply at Dworshak NFH to address disease and temperature problems.

The managers should coordinate the programming of all salmon and steelhead populations reared in the Clearwater Fish Hatchery, Dworshak National Fish Hatchery, Kooskia National Fish Hatchery and Nez Perce Tribal Hatchery to maximize the benefits of available water supply, appropriate water temperature, and rearing containers. Operating these four major hatcheries as a coordinated system would facilitate the movement of programs/populations between and among the different hatcheries. This would maximize survival by producing fish in good condition for release at the appropriate life stage.

The HSRG notes that there is a general lack of information related to steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. An effort should be made to improve this information base.

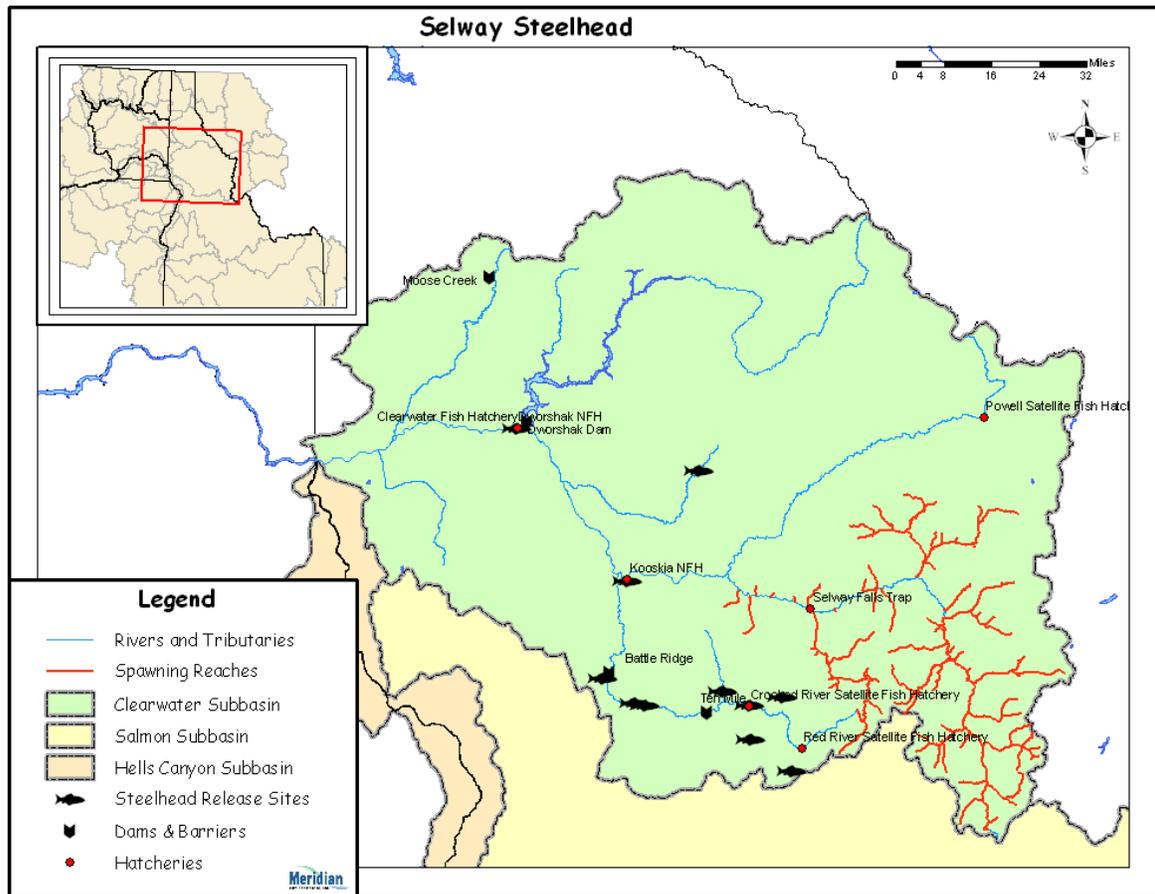
Table 1. Results of HSRG analysis of current condition and HSRG Solution for North Fork Clearwater Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 1,199.3 | 95% | | | | | | 13,389 | 4,059 |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 1,199.3 | 95% | | | | | | 13,389 | 4,059 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 1,199.3 | 95% | | | | | | 13,389 | 4,059 |

Hatchery Scientific Review Group Review and Recommendations

Selway Summer Steelhead (B-run) Population and Related Hatchery Programs

January 31, 2009



1 Selway Summer Steelhead (B-run)

The Selway River summer steelhead population is part of the Snake River Basin Steelhead Distinct Population Segment (DPS) that includes all naturally-spawned populations in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (62 FR 43937; August 18, 1997). Several artificial propagation programs are considered part of the DPS: the Tucannon River natural stock, the North Fork Clearwater River stock reared at Dworshak National Fish Hatchery (NFH) and Clearwater Fish Hatchery and released in the Clearwater and Salmon Rivers¹, East Fork Salmon River local stock, and the Little Sheep Creek/Imnaha River Hatchery steelhead hatchery programs. The DPS was listed as a threatened under the ESA on August 18, 1997; this status was reaffirmed on January 5, 2006.

The DPS has six major population groupings (MPGs): Lower Snake River, Clearwater River, Grande Ronde River, Salmon River, Hells Canyon, and the Imnaha River (ICTRT 2006), and contains both A and B-run steelhead (based on migration timing, ocean-age and adult size). The Selway River population is a natural B-run population and is included in the Clearwater River MPG. This population includes the mainstem Selway River and all tributaries. Like all populations in the MPG, these fish occupy areas upstream from the historical Lewiston Dam, in place from 1927 to 1973. Although the dam was fitted with a fish ladder, it provided only marginal passage for migrating steelhead adults and smolts (Cramer et al. 1998). Unlike Chinook salmon, steelhead were able to maintain access to the Clearwater River subbasin during the dam's existence, and therefore are included in the DPS.

The Interior Columbia Technical Recovery Team (ICTRT) classified Selway River steelhead as an "Intermediate" population based on historical habitat potential. An "Intermediate" population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.30 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

According to the Draft Snake River Steelhead Recovery Plan, Snake River steelhead enter fresh water from June to October and spawn the following spring from March to June. Emergence occurs by early June in low elevation streams and as late as mid-July at higher elevations. Snake River steelhead usually smolt at age-2 or age-3 years and reside in marine waters for 1 to 3 years prior to returning to their natal stream to spawn at 4 or 5 years of age.

There are no estimates of historical steelhead abundance in the Selway River.

2 Current Conditions

Steelhead spawning occurs in the upper mainstem Selway River and numerous tributaries, but high-flow conditions usually prevent documentation of spawning in most streams. The ICRT identified nine major spawning areas (Meadow Creek, the upper Selway River, the Lower Selway River, North Fork Moose Creek, Bear Creek, East Fork Moose Creek, Indian Creek, White Cap Creek, and the Little Clearwater River).

¹ Artificial propagation programs for steelhead in the Clearwater River subbasin are based on the North Fork Clearwater stock that was trapped at the base of Dworshak Dam when construction blocked access to the North Fork in 1969.

Current natural abundance (number of adults spawning in natural production areas) is unknown for this population. In response to this lack of information, the ICTRT developed a generic dataset for B-run steelhead populations to be used for a preliminary assessment of abundance productivity risk (ICTRT 2005). The dataset was derived by distributing the natural-origin steelhead counted annually at Lower Granite Dam equally across the nine extant B-run populations found above the dam. Abundance for the generic B-run steelhead in recent years has been moderately variable. The most recent 10-year geometric mean number of natural spawners was 272 fish. From 1986 to 1998, returns per spawner for the generic “B” run steelhead dataset ranged from 0.24 (1990) to 6.63 (1998). The most recent 13-year SAR adjusted and delimited geometric mean of returns per spawner was 0.85.

For AHA modeling, IDFG estimated natural-origin fish escapement and adjusted productivity for this population to be 1,029 and 1.86, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Selway River steelhead population.

- **ESA Status:** The Snake River Basin steelhead DPS was listed as threatened on August 18, 1997; the threatened status was reaffirmed on January 5, 2006.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Primary. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the Selway River B-run steelhead population as “Intermediate” and identified a minimum abundance threshold of 1,000 natural-origin adults
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Intermediate” is 1.15
- **Habitat Productivity and Capacity:** Productivity: 2.5; Capacity: 2,500

2.2 Current Hatchery Programs Affecting this Population

Currently, there are no hatchery programs for steelhead in the Selway River. Hatchery-origin steelhead are rarely observed in the important production areas in the Lochsa and Selway rivers or in the lower Clearwater River tributaries and are not believed to influence the natural populations.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 45

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in

the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement. See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.9 to 2.0. Average abundance of natural-origin spawners (NOS) would increase from approximately 1,028 fish to approximately 1,136 fish. The harvest contribution of the natural and hatchery populations would go from approximately 288 fish to approximately 319 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Secesh River B-run steelhead that emphasizes maintaining existing natural spawning populations. Currently this population is operating consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

There are no releases of hatchery-origin steelhead within the Lochsa River and the Selway River drainages of the Clearwater River Major Population Group.

Recommendations

The HSRG notes that there is a general lack of information about steelhead abundance, productivity, spatial structure and diversity, as well as straying of hatchery fish into natural production areas. An effort should be made to improve this information base.

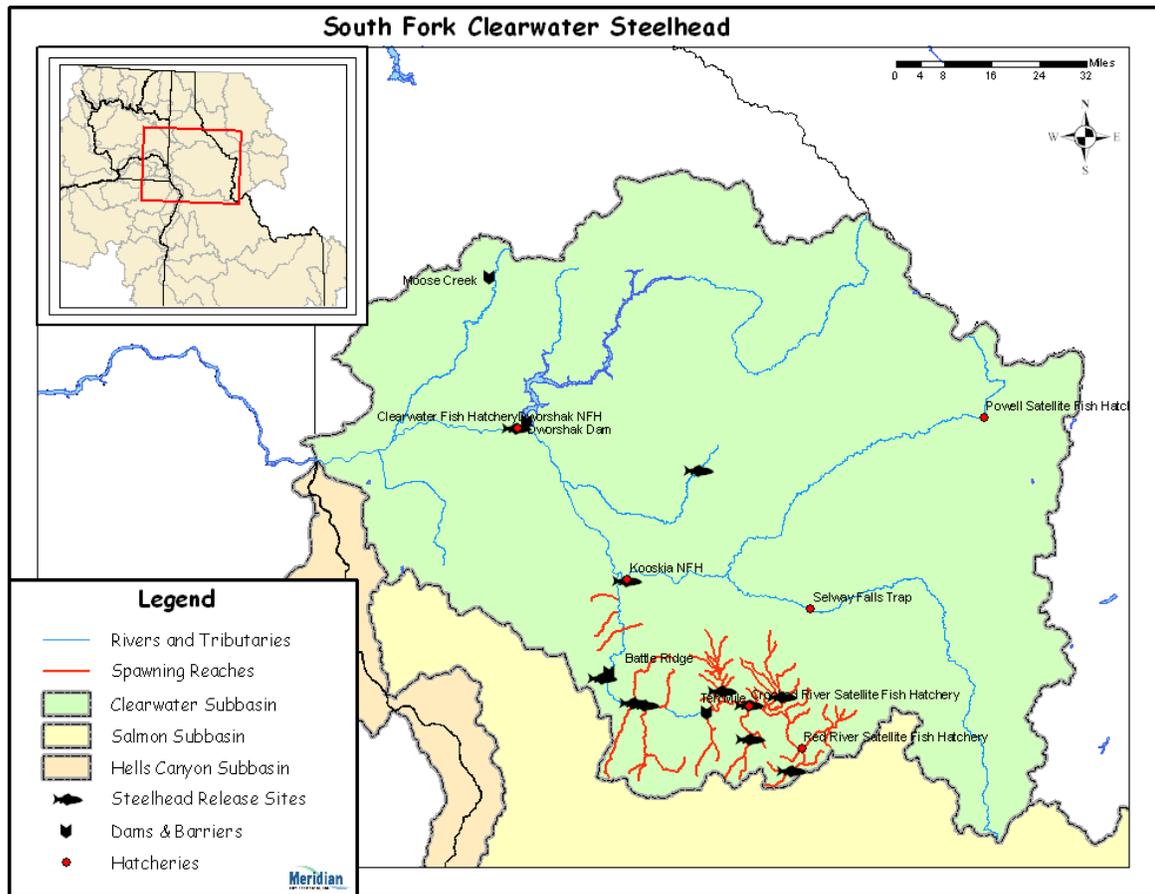
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Selway River Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 1,028 | 1.9 | 288 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,136 | 2.0 | 319 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 1,046 | 1.9 | 294 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 1,285 | 2.1 | 360 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

South Fork Clearwater Summer Steelhead (A and B-run) Population and Related Hatchery Programs

January 31, 2009



1 South Fork Clearwater Summer Steelhead (A+B-run)

The South Fork Clearwater steelhead population is part of the Snake River Basin Steelhead Distinct Population Segment (DPS) that includes all naturally spawned populations of steelhead in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (62 FR 43937; August 18, 1997). Several artificial propagation programs are considered part of the DPS: the Tucannon River natural stock, the North Fork Clearwater River stock reared at Dworshak National Fish Hatchery (NFH) and Clearwater Fish Hatchery and released in the Clearwater and Salmon Rivers¹, East Fork Salmon River local stock, and the Little Sheep Creek/Imnaha River Hatchery steelhead hatchery programs. The DPS was listed as a threatened under the ESA on August 18, 1997; this status was reaffirmed on January 5, 2006.

The DPS has six major population groupings (MPGs): Lower Snake River, Clearwater River, Grande Ronde River, Salmon River, Hells Canyon, and the Imnaha River (ICTRT 2006), and contains both A and B-run steelhead (based on migration timing, ocean-age and adult size). The South Fork Clearwater population is a B-run population found in the South Fork Clearwater River and its tributaries upstream of Mill Creek. Like all populations in the MPG, the South Fork Clearwater River population occupies areas upstream from the historical Lewiston Dam, in place from 1927 to 1973. The dam was fitted with a fish ladder, which provided marginal passage for migrating steelhead adults and smolts (Cramer et al. 1998). Unlike Chinook salmon, steelhead were able to maintain access to the Clearwater River subbasin during the dam's existence, and therefore are included in the DPS.

The Interior Columbia Technical Recovery Team (ICTRT) classified the South Fork Clearwater population as "Intermediate" based on historical habitat potential (ICTRT 2005). An "Intermediate" population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.30 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT. .

According the Draft Snake River Steelhead Recovery Plan, Snake River Basin steelhead trout enter fresh water from June to October and spawn during the following spring from March to May. Emergence occurs by early June in low elevation streams and as late as mid-July at higher elevations. Snake River steelhead usually smolt at age-2 or age-3 years and reside in marine waters for 1 to 3 years prior to returning to their natal stream to spawn at 4 or 5 years of age.

There are no estimates of historical steelhead abundance in the South Fork Clearwater River subbasin. Fish passage in the South Fork Clearwater River has been intermittently blocked or impaired by several dams. The greatest impacts to the indigenous population were from Harpster Dam which spanned River Mile 22 from 1910 through 1963, when it was removed. It completely blocked steelhead passage upstream of the dam from 1911 to 1935 and from 1949 to 1963 (Cramer et al. 1998, as cited in ICTRT 2006).

2 Current Conditions

The current summer steelhead population in the South Fork Clearwater is derived from resident rainbow trout; juvenile stocking from Dworshak Hatchery stock (B-run), adults

¹ Artificial propagation programs for steelhead in the Clearwater River subbasin are based on the North Fork Clearwater stock that was trapped below Dworshak Dam when its construction blocked access to the North Fork in 1969.

that were trapped at Lewiston Dam, and possibly residualized endemic *O. mykiss*. While steelhead spawning has been documented in all of the major spawning areas to the South Fork Clearwater River (Newsome Creek, Johns Creek, the upper South Fork Clearwater River, and the American River) (ICTRT 2006), current abundance (number of adults spawning in natural production areas) is unknown.

In response to this lack of abundance data, the ICTRT developed a generic dataset for B-run steelhead populations to be used for a preliminary assessment of abundance productivity risk (ICTRT 2005). The dataset was derived by distributing the natural-origin steelhead counted annually at Lower Granite Dam equally across the nine extant B-run populations found above the dam. Abundance for the generic B-run steelhead in recent years has been moderately variable; the most recent 10-year geometric mean number of natural spawners was 272 fish. From 1986-1998, returns per spawner for the generic “B” run steelhead dataset ranged from 0.24 (1990) to 6.63 (1998). The most recent 13-year SAR adjusted and delimited geometric mean of returns per spawner was 0.85.

Recent year natural spawners include returns originating from naturally spawning parents. Some strays may also be spawning naturally, as well as hatchery-origin adults returning to the watershed. The proportion of spawners originating from naturally spawning parents is unknown.

Hatchery facilities in this population zone include adult collection facilities and acclimation ponds on Red River and Crooked River.

For AHA modeling, IDFG estimated natural-origin fish escapement and adjusted productivity for this population to be 195 and 0.61, respectively.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the South Fork Clearwater River steelhead population.

- **ESA Status:** The Snake River Basin steelhead DPS was listed as threatened on August 18, 1997; the threatened status was reaffirmed on January 5, 2006.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Stabilizing. The population currently meets the broodstock criteria for this population designation.
- **Recovery Goal for Abundance:** The ICTRT defined the South Fork Clearwater River A/B-run steelhead population as “Intermediate” and identified a minimum abundance threshold of 1,000 natural-origin adults.
- **Productivity Improvement Expectation:** The ICTRT productivity standard associated with a population defined as “Intermediate” is 1.15.
- **Habitat Productivity and Capacity:** Productivity: 1.5; Capacity: 350

2.2 Current Hatchery Programs Affecting this Population

The Dworshak National Fish Hatchery and Clearwater Fish Hatchery operate hatchery programs in the South Fork Clearwater River population zone. All fish are derived from B-run broodstock collected at Dworshak NFH on the North Fork (the Clearwater Hatchery does not have an adult collection facility). Once eggs have reached the eyed-stage of development, they are transferred from the Dworshak to the Clearwater Fish Hatchery.

The Clearwater Hatchery maintains satellite facilities at Crooked River and Red River. Weather permitting, adult collection racks operate at both locations during March and April, although these adults are not transferred to the Clearwater Hatchery to develop broodstock. Instead, hatchery steelhead (adipose fin-clipped) are returned to the river downstream of both weir sites, and supplementation adults (unclipped hatchery-origin adults) may be passed upstream or returned to the river downstream of weir sites. Natural-origin fish are passed upstream of both weirs.

Smolt releases (adipose fin-intact) in this population zone are as follows:

- Newsome Creek, 100,000 – Dworshak NFH rearing
- American River, 100,000 – Dworshak NFH rearing
- Meadow Creek, 25,000 – Clearwater Fish Hatchery rearing
- Crooked River, 83,000 – Clearwater Fish Hatchery rearing
- Red River, 150,000 – Clearwater Fish Hatchery rearing
- Mill Creek, 25,000 – Clearwater Fish Hatchery rearing
- TOTAL ADIPOSE FIN INTACT RELEASES: 483,000

Smolt releases (adipose fin-clipped) in this population zone are as follows:

- South Fork Clearwater River Red House Hole, 400,000 – Dworshak NFH rearing
- Crooked River, 150,000 – Clearwater Fish Hatchery rearing
- Red River, 100,000 – Clearwater Fish Hatchery rearing
- South Fork Clearwater River Red House Hole, 260,000 – Clearwater Fish Hatchery rearing
- TOTAL ADIPOSE FIN-CLIPPED RELEASES: 910,000

Both programs have an R/S of 35.0.

According to the ICTRT, the contribution of supplementation releases and unharvested marked hatchery fish to natural production is unknown; however, it is not suspected to have a selective impact on this population. The number of out-of-DPS strays in the population likely is zero or negligible.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 4,626 to the S.F. Clearwater and 865 to Crooked River
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 3,702 to the S.F. Clearwater and 90 to Crooked River

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations

they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008). Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) for the Upper South Fork would increase from 0.6 to 1.2. Average abundance of natural-origin spawners (NOS) would decrease from approximately 195 fish to approximately 52 fish. The harvest contribution of the hatchery populations would go from approximately 1,497 fish to approximately 15 fish. Estimated Adjusted Productivity for the Crooked River would increase from 0.9 to 1.2. Average abundance of NOS would decrease from 195 fish to 59 fish. The harvest contribution of the population would decrease from 368 fish to 17 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for South Fork Clearwater River A/B-run steelhead that emphasizes maintaining existing natural spawning populations, maintaining current hatchery mitigation programs, and using hatchery-origin steelhead in an attempt to augment natural production. Currently, this population is not meeting the HSRG-defined standards for either a Primary or Contributing population designation (pHOS exceeds 0.10).

Managers have identified both conservation and harvest objectives for the South Fork Clearwater River. This strategy involves a segregated hatchery program with direct release of adipose fin-clipped smolts into South Fork Clearwater River sites and releasing unmarked smolts into the terminal tributaries of the South Fork (Newsome Creek, and Red, American and Crooked rivers).

As currently operated, Dworshak NFH and Clearwater Fish Hatchery produce smolts that are outplanted in the South Fork Clearwater population. Approximately 1.4 million steelhead smolts are planted annually. Of these, approximately 35% (483,000) are released with adipose fins intact. The remaining 65% (910,000) are adipose fin-clipped and released to address harvest mitigation objectives.

Production goals for the proposed harvest program in the lower South Fork Clearwater total 910,000 smolts. Of these, 400,000 smolts are produced at Dworshak and 510,000 are produced at Clearwater Hatchery. All of these fish will be adipose fin-clipped.

Currently, there is no way to control the composition of natural spawners except upstream of adult collection weirs on Crooked River and Red River. The HSRG noted that the adult trapping facility at the Crooked River site offers the best potential to trap returning adults because of its location low in the Crooked River. The Red River weir is higher in the tributary and significant spawning areas are reported below the weir.

Hatchery-origin returning adults (produced annually from Dworshak National Fish Hatchery broodstock), fail to return to terminal release sites (Crooked River and Red River) at levels adequate enough to replace the program.

Recommendations

The HSRG recommends terminating use of Dworshak B-run steelhead releases in the upper South Fork Clearwater River upstream of and including Newsome Creek. The HSRG recommends developing an integrated program with adults collected at the Crooked River site. A production level of approximately 125,000 smolts derived from adults returning to the Crooked River facility would be sufficient to supply eggs for programs releasing smolts in these areas. Phase 1 of the program would focus on developing a locally derived hatchery broodstock based on returns trapped at Crooked River. Phase 2 of the program would transition to 100% natural-origin broodstock. Hatchery adults, in excess of broodstock needs, would be allowed to spawn naturally. With a PNI of 0.5, this population component would be managed consistent with the standards of a Contributing population. Phase 3 of the program could have the potential to replace all or part of the broodstock for the harvest programs in the lower South Fork Clearwater River in the vicinity of Red House Hole. Managers should investigate options to source broodstock from additional locations to the Crooked River adult collection site.

Dworshak B-run steelhead releases should be limited to the lower South Fork Clearwater River in the vicinity of the current release site at Red House Hole. The managers should monitor straying from these releases into the upper watershed to confirm that the contribution to natural spawning meets the standards of a Contributing population (less than 10%). To the extent that the program is successful in the upper watershed, it should replace all or a portion of these Dworshak releases that occur in the lower South Fork Clearwater.

The managers should coordinate the programming of all salmon populations reared in the Clearwater Fish Hatchery, Dworshak NFH, Kooskia NFH and Nez Perce Tribal Hatchery to maximize the benefits of available water supply, appropriate water temperature, and rearing containers. Operating these four major hatcheries as a coordinated system would facilitate the movement of programs/populations between and among the different hatcheries. This would maximize survival by producing fish in good condition for release at the appropriate life stage.

The HSRG notes that there is a general lack of information related to steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. An effort should be made to improve this information base.

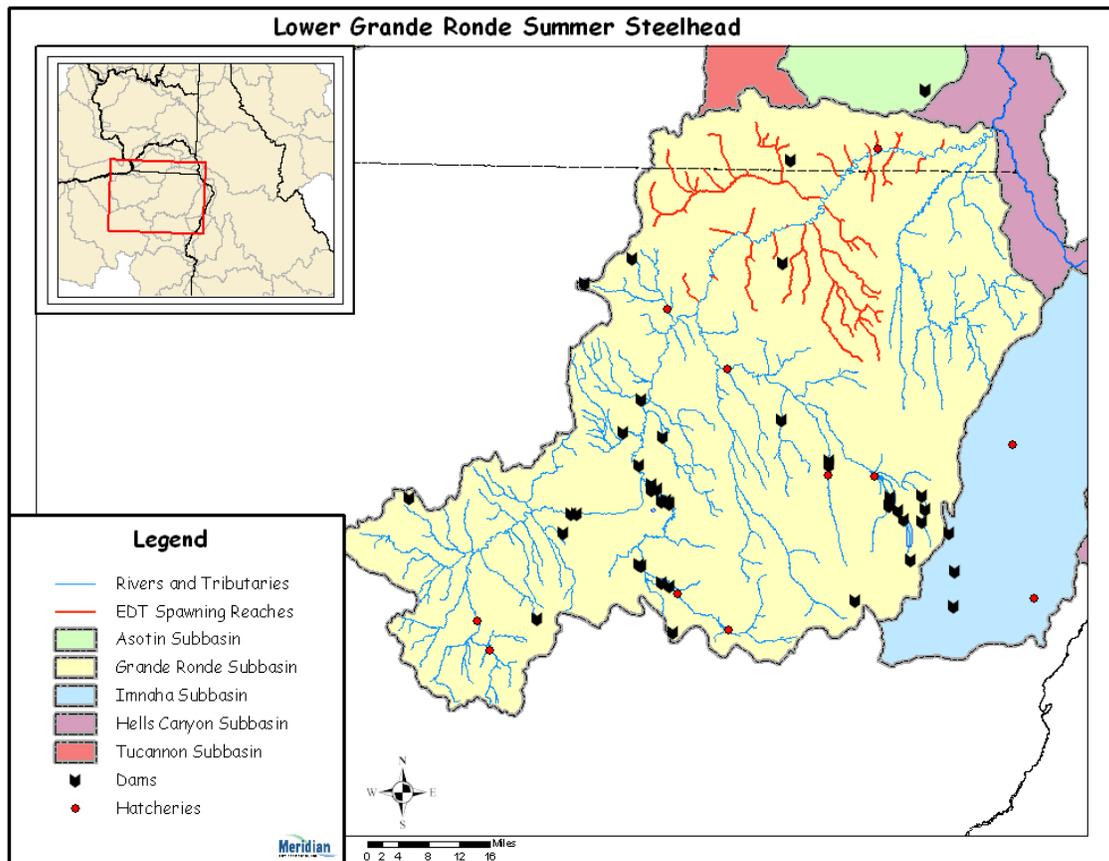
Table 1. Results of HSRG analysis of current condition and HSRG Solution for South Fork Clearwater Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|-------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Upper SF Int Harv | 399.8 | 10% | 0% | 91% | 0.00 | 195 | 0.6 | 1,497 | 515 |
| | Crooked River Int Harv | 84.2 | 20% | 0% | 79% | 0.56 | 195 | 0.9 | 368 | 26 |
| | Seg Harv | 911.3 | 10% | | | | | | 10,173 | 484 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 52 | 1.2 | 15 | - |
| | None None | - | 0% | 0% | 0% | 1.00 | 59 | 1.2 | 17 | - |
| HSRG Solution | Upper SF Int Harv | 248.3 | 10% | 0% | 94% | 0.00 | 212 | 0.6 | 955 | 320 |
| | Crooked River Int Harv | 123.9 | 20% | 0% | 85% | 0.54 | 191 | 0.9 | 515 | 70 |
| | Stepping Stone/Seg Harv | 911.3 | 10% | | | | | | 10,173 | 484 |
| HSRG Solution w/ Improved Habitat | Upper SF Int Harv | 248.3 | 10% | 0% | 93% | 0.00 | 233 | 0.7 | 961 | 320 |
| | Crooked River Int Harv | 123.9 | 20% | 0% | 69% | 0.59 | 156 | 1.0 | 505 | 70 |
| | Stepping Stone/Seg Harv | 911.3 | 10% | | | | | | 10,173 | 484 |

Hatchery Scientific Review Group Review and Recommendations

Grande Ronde-Lower Grande Ronde Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Grande Ronde- Lower Grande Ronde River Summer Steelhead

This population is considered part of the Snake River Steelhead ESU that is classified as threatened under the Endangered Species Act. Steelhead populations in the ESU include all naturally spawned fish in the Tucannon, Clearwater, Grande Ronde, Imnaha, Salmon rivers and Asotin Creek.

The Interior Columbia Technical Recovery Team (ICTRT) classified this population as “Intermediate”. An “Intermediate” population is one that requires a minimum abundance of 1,000 wild spawners and an intrinsic productivity greater than 1.15 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

Historically, it was estimated that over 2 million steelhead returned to the Columbia River Basin, with about 25% of these originating from the Snake River. Ice Harbor Dam counts indicate that over a 100,000 steelhead returned to the Snake River in the early 1960s. EDT modeling of historic habitat conditions indicates the basin may have supported over 2,500 adult steelhead (Draft Snake River Recovery Plan 2007). Additionally, it was estimated that in the late 1950s, total steelhead escapement to the Grande Ronde River was approximately 15,900 adults (NPPC 2004).

2 Current Conditions

This population includes the mainstem Grande Ronde River and all tributaries (including Mudd Creek) upstream to the confluence of the Wallowa River, except the Joseph Creek drainage. The population includes fish spawning in the Wenaha River subbasin, which is located in a designated wilderness area.

Adult escapement to the Lower Grande Ronde River and tributaries has been estimated at approximately 600 fish. There are currently two hatchery program that release summer steelhead: one from Cottonwood Acclimation Pond and an upriver hatchery program at Wallowa Hatchery. Both programs use Wallowa stock hatchery fish to provide harvest. No hatchery fish are released in the Wenaha River or Joseph Creek as both are designated as wild fish management areas.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Snake River steelhead are listed as threatened under ESA.
- Population Description: The ICTRT classifies this population as Intermediate. For the HSRG review, the population has been classified as Primary.
- Recovery Goal for Abundance: 1,000 fish
- Productivity Improvement Expectation: Increase to 1.15 over time as habitat actions designed to improve the abundance and productivity of ESA listed steelhead and Chinook are implemented in the subbasin.
- Habitat Productivity and Capacity: Productivity 3.9; Capacity 1,951

2.2 Current Hatchery Programs Affecting this Population

Summer steelhead reared at Lyons Ferry Hatchery are released each year into the Grande Ronde River from Cottonwood Acclimation Pond. Broodstock for the program (originally derived from Wallowa stock) is collected at the Cottonwood Creek adult trap, where adults are held and spawned. Eggs are transferred to Lyons Ferry; juvenile rearing occurs here as well. Juvenile fish are transferred in February from Lyons Ferry to the Cottonwood Acclimation Pond. Fish are allowed to voluntarily migrate from the pond beginning around April 1 each year. Those remaining in the pond are forced out in late April. The program is designed to provide 1,500 adults for harvest in the Snake River Basin and has a release goal of 160,000 yearling summer steelhead. All fish released are marked with an adipose fin-clip. Approximately 20,000 of those are also marked with a left-ventral clip and given a coded wire-tag for program monitoring. In recent years, a portion of those have also been given a PIT-tag to better estimate full returns to the Snake River Basin.

The program has an R/S value of 19.2 (1992-2002 Brood Year average).

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: None
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 125

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.9 to 3.5. Average abundance of natural-origin spawners (NOS) would increase from approximately 1,178 fish to approximately 1,420 fish. The harvest contribution of the natural and hatchery populations would go from approximately 2,955 fish to approximately 161 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Lyons Ferry Hatchery (LFH) and Tucannon Fish Hatchery (TFH) were built/modified under the Lower Snake River Fish and Wildlife Compensation Plan to compensate for the annual loss of summer steelhead caused by hydroelectric projects on the Snake River.

The Lyons Ferry Hatchery Complex currently uses four summer steelhead stocks to produce smolts for release into the Snake (60,000 smolts of LFH stock), Tucannon (100,000 smolts of LFH stock, 50,000 smolts of Tucannon Endemic stock), Grande Ronde (160,000 smolts of Wallowa stock), Walla Walla (100,000 smolts of LFH stock), and Touchet rivers (85,000 smolts of LFH stock, 50,000 smolts of Touchet Endemic stock) to enhance recreational opportunities for steelhead anglers and for recovery purposes. All steelhead smolts for the program are planned for a release size of 4.5 fpp (about 100 g/fish). Current releases of summer steelhead smolts are lower than originally specified by the LSRCP program. Releases have periodically been reduced through the years (in 2001 the LFH and Wallowa stock programs were reduced by 37%) in partial response to Endangered Species Act (ESA) concerns and documented smolt-to-adult (SAR) survival rates far exceeding the original SAR goal of 0.5% (USACE 1975; Lyons Ferry Complex Hatchery Evaluation: Summer Steelhead Annual Report 2005 Run Year June 2007).

Managers have not assigned a population designation for the Lower Grande Ronde River summer steelhead. Currently this population appears to be managed consistent with the standards of a Primary population; however, the HSRG noted a general lack of specific information about this population.

The production goal for the Cottonwood Creek program is to release approximately 160,000 smolts designed to provide harvest. Adult trapping and smolt acclimation occur at the Cottonwood acclimation facility. Incubation and rearing occur at Lyons Ferry. All

fish in excess of broodstock needs are passed upstream of the adult trap in Cottonwood Creek (1,000 to 2,000 fish annually).

Recommendations

The HSRG recommends that managers discontinue passing hatchery fish upstream of the hatchery rack. The HSRG encourages managers to explore opportunities to increase the harvest contribution, such as increasing daily bag limits. The HSRG supports alternate uses of surplus fish such as distribution to local food banks and/or stream nutrification.

The HSRG recommends that managers improve the monitoring of steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas.

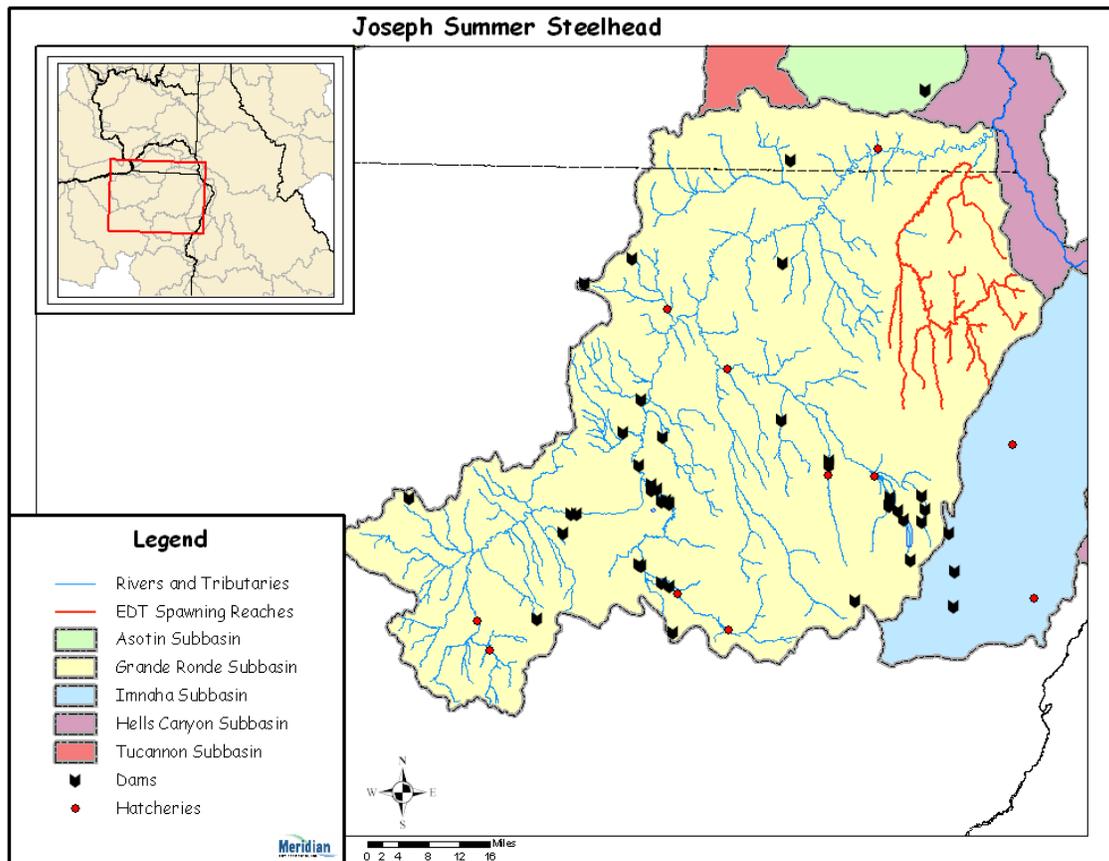
Table 1. Results of HSRG analysis of current condition and HSRG solution for Lower Grande Ronde Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|--------------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 5% | 0.00 | 1,193 | 2.9 | 135 | 0 |
| | Seg Harv | 160.1 | 85% | | | | | | 2,821 | 640 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,419 | 3.5 | 161 | - |
| HSRG Solution | None None | - | 0% | 0% | 4% | 0.00 | 1,229 | 3.0 | 139 | 0 |
| | Seg Harv | 160.1 | 85% | | | | | | 2,944 | 536 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 3% | 0.00 | 1,443 | 3.4 | 164 | 0 |
| | Seg Harv | 160.1 | 85% | | | | | | 2,944 | 536 |

Hatchery Scientific Review Group Review and Recommendations

Grande Ronde-Joseph Creek Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Grande Ronde- Joseph Creek Summer Steelhead

The Joseph Creek steelhead population is part of the Snake River Basin Steelhead Distinct Population Segment (DPS) that includes all naturally spawned populations of steelhead in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (62 FR 43937; August 18, 1997). Several artificial propagation programs are considered part of the DPS: the Tucannon River natural stock, the North Fork Clearwater River stock reared at Dworshak National Fish Hatchery (NFH) and Clearwater Fish Hatchery and released in the Clearwater and Salmon Rivers¹, East Fork Salmon River local stock, and the Little Sheep Creek/Imnaha River Hatchery steelhead hatchery programs.

The DPS has six major population groupings (MPGs): Lower Snake River, Clearwater River, Grande Ronde River, Salmon River, Hells Canyon, and the Imnaha River (ICTRT 2006), and contains both A and B-run steelhead (based on migration timing, ocean-age and adult size).

The Interior Columbia Technical Recovery Team (ICTRT) classified the Joseph Creek population as a “Basic” population based on historical habitat potential. A steelhead population classified as Basic has a mean minimum abundance threshold of 500 naturally produced spawners with sufficient intrinsic productivity to achieve a 5% or less risk of extinction over a 100-year timeframe.

According to the Draft Snake River Steelhead Recovery Plan, Snake River steelhead enter fresh water from June to October and spawn the following spring from March to June. Emergence occurs by early June in low elevation streams and as late as mid July at higher elevations. Snake River steelhead usually smolt at age 2 or age 3 years and reside in marine waters for 1 to 3 years prior to returning to their natal stream to spawn at 4 or 5 years of age.

EDT modeling of historic steelhead production indicates that the stream may have produced over 2,750 adults.

2 Current Conditions

Summer steelhead spawn in Joseph Creek and its major tributaries (e.g. Chesnimnus and Elk creeks). Recent estimates have put steelhead escapement at a little over 1,500 fish (Draft Snake River Recovery Plan). The watershed is reserved for wild fish production only; therefore, no hatchery fish are released to the stream.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Joseph Creek steelhead population.

- **ESA Status:** The Snake River Basin steelhead DPS was listed as threatened on August 18, 1997; the threatened status was reaffirmed on January 5, 2006.
- **Population Description:** The ICTRT classified the Joseph Creek population as a “Basic” population based on historical habitat potential (ICTRT 2005). For the HSRG review, the population has been classified as Primary.

¹ Artificial propagation programs for steelhead in the Clearwater River subbasin are based on the North Fork Clearwater stock which was trapped at the foot of Dworshak Dam when it blocked access to the North Fork in 1969.

- Recovery Goal for Abundance: 500 fish
- Productivity Improvement Expectation: The 100-year geometric mean for abundance and productivity (i.e. growth rate) of A-run steelhead in Joseph Creek will be improved to exceed the 5% extinction-risk (viability) curves developed by the ICTRT (e.g., ~ 500 spawners at a productivity of 1.3).
- Habitat Productivity and Capacity: Productivity: 3; Capacity: 3,500

2.2 Current Hatchery Programs Affecting this Population

Currently, there are no steelhead hatchery programs in Joseph Creek. The stream is reserved by WDFW for natural steelhead production only.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated programs: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 3 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Because there is currently no hatchery influence on this population (pHOS = 0) our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would stay at 2.7, average abundance of natural-origin spawners (NOS) would

remain at approximately 2,240 fish, and the harvest contribution of the natural population would remain at 250 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Joseph Creek steelhead that emphasizes maintaining existing natural spawning populations. Currently this population is managed for natural production consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

Recommendations

The HSRG has no specific recommendations for this population.

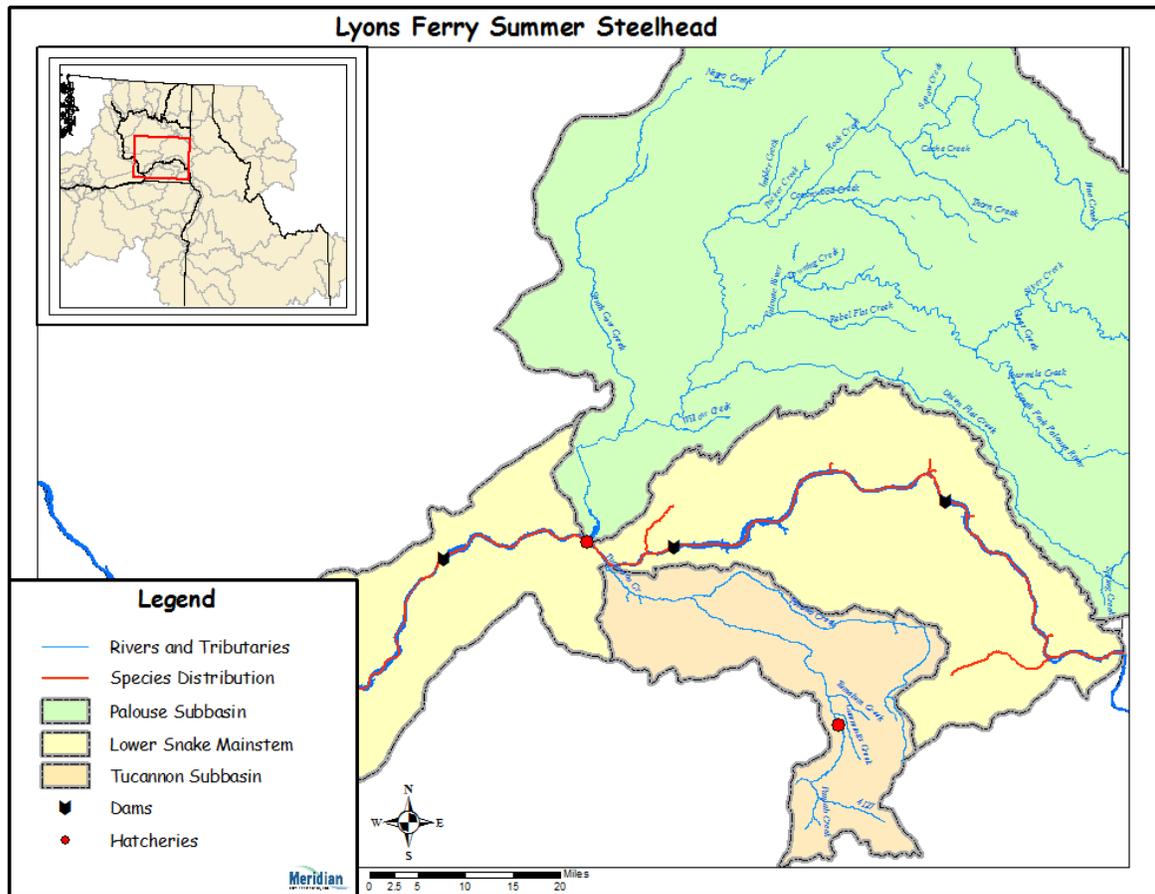
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Joseph Creek Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 0% | 1.00 | 2,237 | 2.7 | 254 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 2,239 | 2.7 | 254 | - |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 2,238 | 2.7 | 254 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 2,596 | 3.0 | 295 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Lyons Ferry Summer Steelhead (A-run) Population and Related Hatchery Programs

January 31, 2009



1 Lyons Ferry Summer Steelhead (A-run)

This is a segregated hatchery program that is not associated with a natural population. The hatchery stock is not listed under ESA.

2 Current Conditions

Summer steelhead are reared at Lyons Ferry Hatchery located along the lower Snake River in Franklin County, Washington (RM 58). The program goal is to produce and release 60,000 smolts directly to the mainstem Snake River to provide harvest opportunities and broodstock for the Lyons Ferry Hatchery stock programs in the Walla Walla, Tucannon and Touchet rivers. All juvenile steelhead released are adipose fin-clipped. Approximately 20,000 also have a left-ventral clip and coded wire-tag. In recent years a portion has been PIT-tagged. Broodstock for the program is collected at Lyons Ferry Hatchery. Only hatchery-origin fish are used as broodstock. The program was initiated with broodstock from Wells Hatchery and Wallowa Hatchery. All adult holding, egg incubation and rearing occurs at Lyons Ferry. The SAR to the lower Snake River (based on coded wire-tag data) has averaged 1.7% since 1982. The SAR to the Columbia River for the juvenile releases has averaged 2.0%. The AHA model assumes an R/S value of 10.6. Based on the 1989 to 2002 Brood Year average, the program has had an R/S value of 17.3.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Not listed
- Population Description: Segregated hatchery population
- Recovery Goal for Abundance: NA
- Productivity Improvement Expectation: NA
- Habitat Productivity and Capacity: Productivity: NA; Capacity: NA

2.2 Current Hatchery Programs Affecting this Population

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: NA

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For

example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

This is a segregated hatchery program that is not associated with a natural population.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Lyons Ferry Hatchery (LFH) and Tucannon Fish Hatchery (TFH) were built/modified under the Lower Snake River Fish and Wildlife Compensation Plan to compensate for the annual loss of summer steelhead caused by hydroelectric projects on the Snake River.

The Lyons Ferry Hatchery Complex currently uses four summer steelhead stocks to produce smolts for release into the Snake (60,000 smolts of LFH stock), Tucannon (100,000 smolts of LFH stock, 50,000 smolts of Tucannon Endemic stock), Grande Ronde (160,000 smolts of Wallowa stock), Walla Walla (100,000 smolts of LFH stock), and Touchet rivers (85,000 smolts of LFH stock, 50,000 smolts of Touchet Endemic stock) to enhance recreational opportunities for steelhead anglers and for recovery purposes. All steelhead smolts for the program are planned for a release size of 4.5 fpp (about 100 g/fish). Current releases of summer steelhead smolts are lower than originally specified by the LSRCP program. Releases have periodically been reduced through the years (in 2001 the LFH and Wallowa stock programs were reduced by 37%) in partial response to Endangered Species Act (ESA) concerns and documented smolt-to-adult (SAR) survival rates far exceeding the original SAR goal of 0.5% (USACE 1975).

(Lyons Ferry Complex Hatchery Evaluation: Summer Steelhead Annual Report 2005 Run Year June 2007)

The Lyons Ferry on-station release makes a significant contribution to the recreational harvest. This is a segregated hatchery program that currently provides broodstock for segregated programs in the Walla Walla, Touchet and Tucannon rivers. The HSRG made recommendations for each of these systems to provide local broodstock for these programs (Walla Walla and Touchet) or terminate the program (Tucannon). If these recommendations were implemented, the need for an on-station Lyons Ferry release to provide broodstock for these tributary programs no longer would be required.

The HSRG was provided no information about whether this release group is straying to natural production areas or above Lower Granite Dam.

Information from WDFW indicates that approximately 55% of adults escaping the fishery return to the hatchery, leaving 45% of the hatchery population unaccounted for and potentially straying into the nearby Tucannon and Asotin populations.

Recommendations

The HSRG recommends that managers determine the disposition of unaccounted for hatchery strays from this segregated program and ways to reduce them (i.e. leave the trap open longer at Lyons Ferry Hatchery to recover a higher proportion of hatchery returns and if necessary to meet the manager’s conservation goals, utilize temporary weirs to exclude hatchery fish from nearby natural populations).

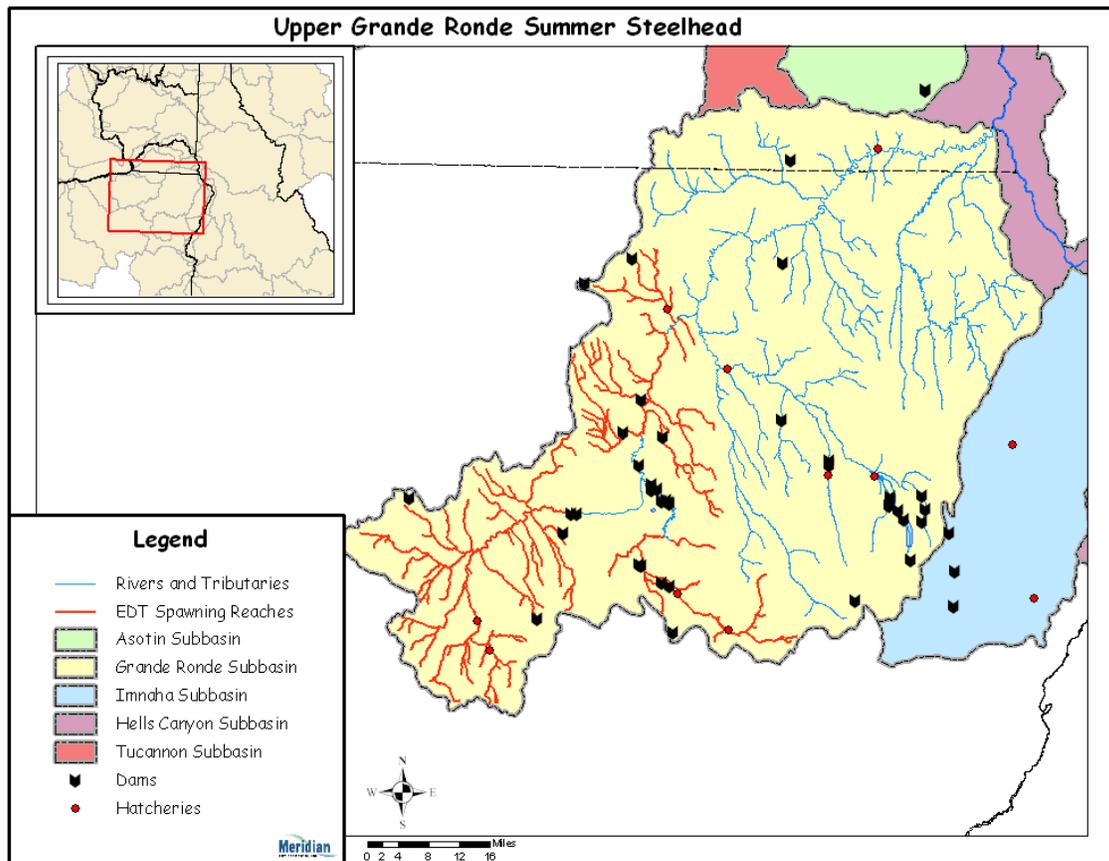
Table 1. Results of HSRG analysis of current condition and HSRG solution for Lyons Ferry Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | | | | | | | | | | |
| | Seg Harv | 60.6 | 55% | | | | | | 820 | 192 |
| No Hatchery | | | | | | | | | | |
| HSRG Solution | | | | | | | | | | |
| | Seg Harv | 60.6 | 85% | | | | | | 820 | 319 |
| HSRG Solution w/ Improved Habitat | | | | | | | | | | |
| | Seg Harv | 60.6 | 85% | | | | | | 820 | 319 |

Hatchery Scientific Review Group Review and Recommendations

Grande Ronde-Upper Grande Ronde River Summer Steelhead Population and Related Hatchery Programs

January 31, 2009



1 Grande Ronde- Upper Grande Ronde River Summer Steelhead

The Upper Grande Ronde River steelhead population is part of the Snake River Basin Steelhead Distinct Population Segment (DPS) that includes all naturally spawned populations of steelhead in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (62 FR 43937; August 18, 1997). Several artificial propagation programs are considered part of the DPS: the Tucannon River natural stock, the North Fork Clearwater River stock reared at Dworshak National Fish Hatchery (NFH) and Clearwater Fish Hatchery and released in the Clearwater and Salmon Rivers¹, East Fork Salmon River local stock, and the Little Sheep Creek/Imnaha River Hatchery steelhead hatchery programs.

The DPS has six major population groupings (MPGs): Lower Snake River, Clearwater River, Grande Ronde River, Salmon River, Hells Canyon, and the Imnaha River (ICTRT 2006), and contains both A- and B-run steelhead (based on migration timing, ocean-age and adult size).

The Interior Columbia Technical Recovery Team (ICTRT) classified the Upper Grande Ronde River population as “Large” based on historical habitat potential. A steelhead population classified as Large has a mean minimum abundance threshold of 1,500 naturally produced spawners with sufficient intrinsic productivity to achieve a 5% or less risk of extinction over a 100-year timeframe.

According to the Draft Snake River Steelhead Recovery Plan, Snake River steelhead enter fresh water from June to October and spawn the following spring, from March to June. Emergence occurs by early June in low elevation streams and as late as mid-July at higher elevations. Snake River steelhead usually smolt at age 2 or age 3 years and reside in marine waters for 1 to 3 years prior to returning to their natal stream to spawn at 4 or 5 years of age.

2 Current Conditions

This population consists of all naturally spawned fish in the upper Grande Ronde River, Lookingglass Creek, Catherine Creek, Indian Creek and Dry Creek. No hatchery steelhead are released in these areas.

Recent estimates have put steelhead escapement at a little over 1,800 fish (Draft Snake River Recovery Plan). The watershed is currently managed for wild fish production only; therefore, no hatchery fish are released to the stream.

Strays from the Wallowa Hatchery program are a concern. Three tributaries are monitored for the proportion of hatchery-to-wild-origin fish: Catherine Creek, Lookingglass Creek, and the Upper Grand Ronde.

A total of 1,165 adult summer steelhead were captured in Catherine Creek from 2002 to 2008. Of these, only four adults were of hatchery origin. From 1997-2003, the most hatchery fish observed at the weir was 50 (in 2001). All of these fish were destroyed. A total of 1,210 adult summer steelhead were captured in Lookingglass Creek from 2002 to 2008. Of these, only 17 adults were of hatchery origin. All of these fish were destroyed. At the Upper Grande Ronde adult collection facility, a total of 290 adults were captured

¹ Artificial propagation programs for steelhead in the Clearwater River subbasin are based on the North Fork Clearwater stock trapped at the foot of Dworshak Dam when its construction blocked access to the North Fork in 1969.

from 2002 to 2008. One hatchery adult was observed at the trap and it was destroyed (McLean et al 2008 per comm.). Overall, strays in Upper Grande Ronde tributaries are estimated at 0.77% since 2002.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Upper Grande Ronde River steelhead population.

- **ESA Status:** The Snake River Basin steelhead DPS was listed as threatened on August 18, 1997; the threatened status was reaffirmed on January 5, 2006.
- **Population Description:** The ICTRT classified the Upper Grande Ronde River population as a “Large” population based on historical habitat potential (ICTRT 2005). For the HSRG review, the population has been classified as Primary.
- **Recovery Goal for Abundance:** 1,500 fish
- **Productivity Improvement Expectation:** The 100-year geometric mean for abundance and productivity (i.e. growth rate) of steelhead in Upper Grande Ronde River will be improved to exceed the 5% extinction-risk (viability) curves developed by the ICTRT (e.g., ~ 1,500 spawners at a productivity of 1.1).
- **Habitat Productivity and Capacity:** Productivity: 1.8; Capacity: 3,665

2.2 Current Hatchery Programs Affecting this Population

Currently, there are no hatchery programs for steelhead in Upper Grande Ronde River.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated programs: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 17 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The

solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Since this population currently experiences very little hatchery impact, removing hatchery effects makes no change to productivity, abundance, or natural spawning. Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would stay at 1.6, average abundance of natural-origin spawners (NOS) would remain at approximately 1,350 fish, and the harvest contribution of the natural population would remain at approximately 150 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Upper Grande Ronde summer steelhead that emphasizes maintaining existing natural spawning populations. Currently this population is being managed for natural production consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05). Three weirs are operated in the basin to monitor the steelhead population trend and distribution. The few hatchery strays that have been observed are removed at the weirs.

Recommendations

The HSRG recommends that the managers continue operating the three weirs to collect information about this population. These three weirs provide one of the few locations for consistent monitoring of long-term steelhead population trends in the Snake River Basin.

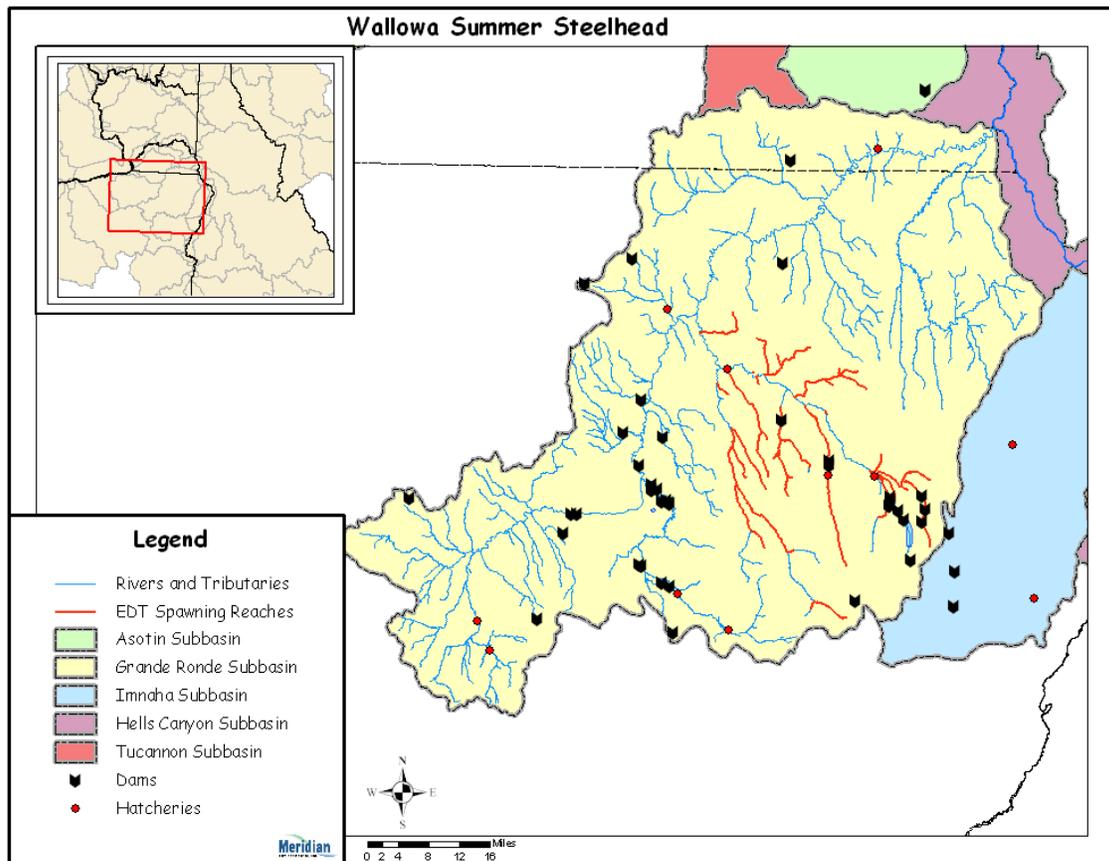
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Upper Grande Ronde Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None | - | 0% | 0% | 0% | 1.00 | 1,310 | 1.6 | 149 | 0 |
| | None | | | | | | | | | |
| No Hatchery | None | - | 0% | 0% | 0% | 1.00 | 1,394 | 1.6 | 158 | - |
| HSRG Solution | None | - | 0% | 0% | 0% | 1.00 | 1,392 | 1.6 | 158 | 0 |
| | None | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None | - | 0% | 0% | 0% | 1.00 | 1,770 | 1.8 | 201 | 0 |
| | None | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Grande Ronde-Wallowa Summer Steelhead and Related Hatchery Programs

January 31, 2009



1 Grande Ronde- Wallowa River Summer Steelhead

This population is considered part of the Snake River Steelhead ESU that is classified as threatened under the Endangered Species Act. Steelhead populations in the ESU include all naturally spawned fish in the Tucannon, Clearwater, Grande Ronde, Imnaha, Salmon and Asotin Creek.

The Interior Columbia Technical Recovery Team (ICTRT) classified this population as “Intermediate”. An “Intermediate” population is one that requires a minimum abundance of 1,000 wild spawners and an intrinsic productivity greater than 1.15 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

Historically, it was estimated that over 2-million steelhead returned to the Columbia River Basin, with about 25% of these originating from the Snake River. Ice Harbor Dam counts indicate that over a 100,000 steelhead returned to the Snake River in the early 1960s.

EDT modeling of historic habitat conditions indicates the Wallowa may have supported over 2,500 adult steelhead (Draft Snake River Recovery Plan 2007).

2 Current Conditions

This population includes all naturally spawned fish in the Wallowa, Minam and Lostine rivers, as well as several small tributaries. Prairie Creek is also included in this population.

Wild adult escapement to the Wallowa River and tributaries has been estimated at approximately 1,200 fish (NPPC 2004). There is currently one hatchery program that releases summer steelhead in the Wallow River to provide 9,200 adults for harvest.

The Wallowa Hatchery stock originated from adults collected during the spring at Ice Harbor (in 1976) and Little Goose (in 1977 and 1978) dams as well as embryos from Pahsimeroi Fish Hatchery in Idaho (in 1979). Since 1979, Wallowa stock adults returning to Wallowa Hatchery, Big Canyon, and Cottonwood traps have been used as broodstock.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Snake River steelhead are listed as threatened under ESA.
- Population Description: The ICTRT classifies this population as Intermediate. For the HSRG review, the population has been classified as Primary.
- Recovery Goal for Abundance: 1,000 fish
- Productivity Improvement Expectation: Increase to 1.15 over time as habitat actions designed to improve the abundance and productivity of ESA listed steelhead and Chinook are implemented in the basin.
- Habitat Productivity and Capacity: Productivity: 2.9; Capacity: 2,000

2.2 Current Hatchery Programs Affecting this Population

The Wallowa summer steelhead program is a segregated program with a release target of 800,000 yearling smolts (4 fpp). The program has been sized to produce approximately 9,200 adults for harvest and hatchery broodstock. All fish released under this program are adipose fin-clipped. A description of hatchery operations is presented below.

Adult Collection and Holding: Adult summer steelhead (HOR only) are collected in the Wallowa subbasin (HUC-17060105) at Wallowa Hatchery and at the Big Canyon facility and held at Wallowa Hatchery. Adults surplus to broodstock needs are released into closed waters or sent to food banks. Wallowa Hatchery is located along Spring Creek (RK 1), a tributary to the Wallowa River at RK 66.8, and one mile west of Enterprise, Oregon. Big Canyon facility is operated as a satellite to Wallowa Hatchery. It is located on Deer Creek (RK 0.1) at the confluence of Deer Creek and the Wallowa River (RK 17.7), just east of Minam, Oregon.

Spawning: Fish collected at Big Canyon Hatchery and Wallowa Hatchery are spawned at Wallowa Hatchery.

Early Incubation: Incubation of eggs from green egg to eyed egg stage occurs at Wallowa Hatchery.

Final incubation and Rearing: Final incubation (eyed egg to hatching) and rearing to smolt size occurs at Irrigon Hatchery. Irrigon Hatchery is located along the south bank of the Columbia River, above John Day Dam, near Irrigon, Oregon.

Currently, a small group (400) of eyed eggs is appropriated to a STEP program. These fish are reared from eyed-egg to fry in local classroom incubators, and are released into Marr Pond (200) and Wallowa Wildlife Pond (200) near Enterprise and Wallowa, Oregon, respectively.

Acclimation to release: Smolts are transferred from Irrigon Hatchery in February and April and acclimated at Wallowa Acclimation Pond (Wallowa Hatchery) and held for varying lengths of time, before being released into the Wallowa River. Other smolts are transferred from Irrigon Hatchery to Big Canyon Acclimation Pond in March and April, and acclimated for one month before being released into Deer Creek (a tributary to the Wallowa River).

The program has an R/S value of 15.0.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 17 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing

populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.5 to 2.6. Average abundance of natural-origin spawners (NOS) would increase from approximately 1,220 fish to approximately 1,250 fish. The harvest contribution of the natural and hatchery populations would go from approximately 6,169 fish to approximately 142 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below, we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Wallowa summer steelhead that emphasizes maintaining existing natural spawning populations as well as maintaining the current hatchery mitigation program. Currently the segregated hatchery program is operating consistent with the HSRG-defined standards of a Primary population (pHOS less than 0.05).

The total production objective for the Wallowa River summer steelhead program is to release 800,000 smolts (4 fpp). The program is partial fulfillment of the LSRCP adult return goal of 11,200 adult steelhead to the project area. Adult summer steelhead (HOR only) are collected in the Wallowa subbasin at Wallowa Hatchery and at the Big Canyon

facility and held and spawned at Wallowa Hatchery. Incubation of eggs from green egg to eyed egg stage also occurs at Wallowa Hatchery. Final incubation (eyed egg to hatching) and rearing to smolt size occurs at Irrigon Hatchery. Smolts are transferred from Irrigon Hatchery in February and April and acclimated at Wallowa Acclimation Pond (Wallowa Hatchery) and held for varying lengths of time, before being released into the Wallowa River. Other smolts are transferred from Irrigon Hatchery to Big Canyon Acclimation Pond in March and April, and acclimated for one month before being released into Deer Creek (a tributary to the Wallowa River). Information provided by the managers indicates this is a well segregated hatchery program. Hatchery fish contribute less than 2% of the natural spawning fish in this population. However, this hatchery stock has contributed strays to locations outside the Grande Ronde subbasin (to the mid-Columbia Distinct Population Segment).

Currently there appears to be a consistent surplus of 1,000 to 2,000 hatchery adults returning to the collection facility annually.

Recommendations

The HSRG has no specific recommendations to improve this hatchery program.

The HSRG recommends that managers continue to monitor steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. We also recommend that the managers continue to explore ways to reduce straying to out-of-basin areas such as the Deschutes and John Day rivers.

The HSRG encourages managers to explore opportunities to increase the harvest contribution, such as increasing daily catch limits.

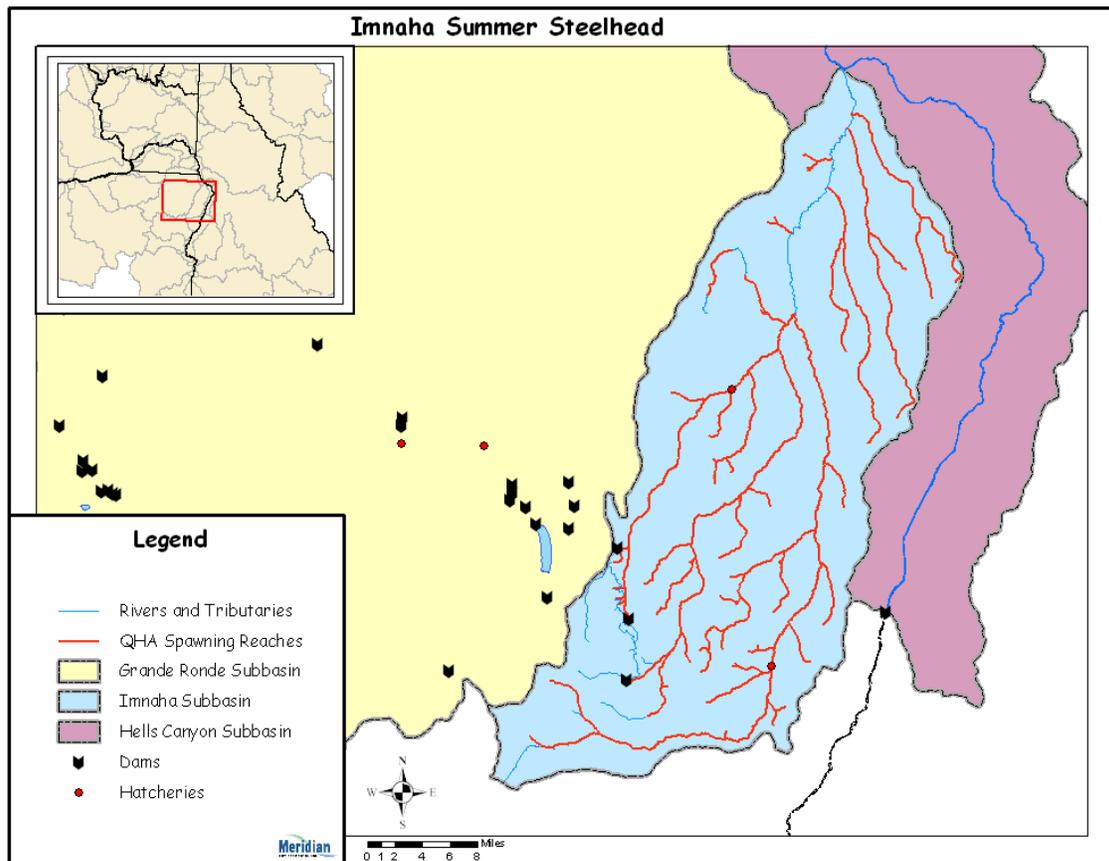
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Wallowa Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 1,220 | 2.5 | 139 | 0 |
| | Seg Harv | 799.3 | 99% | | | | | | 6,030 | 2,523 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,249 | 2.6 | 142 | - |
| HSRG Solution | None None | - | 0% | 0% | 1% | 0.00 | 1,183 | 2.5 | 134 | 0 |
| | Seg Harv | 799.3 | 99% | | | | | | 6,799 | 1,761 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 1% | 0.00 | 1,397 | 2.7 | 159 | 0 |
| | Seg Harv | 799.3 | 99% | | | | | | 6,799 | 1,761 |

Hatchery Scientific Review Group Review and Recommendations

Innaha River Summer Steelhead Population (A-Run) and Related Hatchery Programs

January 31, 2009



1 Imnaha River Summer Steelhead

The Imnaha River steelhead population is part of the Snake River Basin Steelhead Distinct Population Segment (DPS) that includes all naturally spawned populations of steelhead in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (62 FR 43937; August 18, 1997). Several artificial propagation programs are considered part of the DPS: the Tucannon River natural stock, the North Fork Clearwater River stock reared at Dworshak National Fish Hatchery (NFH) and Clearwater Fish Hatchery and released in the Clearwater and Salmon Rivers¹, East Fork Salmon River local stock, and the Little Sheep Creek/Imnaha River Hatchery steelhead hatchery programs.

The DPS has six major population groupings (MPGs): Lower Snake River, Clearwater River, Grande Ronde River, Salmon River, Hells Canyon, and the Imnaha River (ICTRT 2006), and contains both A- and B-run steelhead (based on migration timing, ocean-age and adult size).

The Interior Columbia Technical Recovery Team (ICTRT) classified the Imnaha River population as an “Intermediate” population based on historical habitat potential. A steelhead population is classified as Intermediate if it has a mean minimum abundance threshold of 1,000 naturally produced spawners with sufficient intrinsic productivity to achieve a 5% or less risk of extinction over a 100-year timeframe.

According to the Draft Snake River Steelhead Recovery Plan, Snake River steelhead enter fresh water from June to October and spawn the following spring from March to June. Emergence occurs by early June in low elevation streams and as late as mid-July at higher elevations. Snake River steelhead usually smolt at age 2 or age 3 years and reside in marine waters for 1 to 3 years prior to returning to their natal stream to spawn at 4 or 5 years of age.

2 Current Conditions

This population includes all naturally spawning fish in the Imnaha River and its tributaries. Escapement of natural and hatchery fish was monitored from 2000 to 2007 by the Nez Perce Tribe in two tributary streams, Cow Creek and Lightning Creek. Escapement to Lightning Creek ranged from 36 to 232 fish, an average of 95% (92 to 99%) of which were natural-origin spawners. Escapement to Cow Creek ranged from 27 to 128 fish, an average of 87% (73 to 95%) of which were natural-origin spawners (Nez Perce Tribe unpublished data).

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Imnaha River steelhead population.

- **ESA Status:** The Snake River basin steelhead DPS was listed as threatened on August 18, 1997; the threatened status was reaffirmed on January 5, 2006.

¹ Artificial propagation programs for steelhead in the Clearwater River subbasin are based on the North Fork Clearwater stock which was trapped at the foot of Dworshak Dam when access to the North Fork was blocked in 1969.

- Population Description: The ICTRT classified the Imnaha River population as an “Intermediate” population based on historical habitat potential (ICTRT 2005). For the HSRG review, the population has been classified as Primary.
- Recovery Goal for Abundance: 1,500 fish
- Productivity Improvement Expectation: The 100-year geometric mean for abundance and productivity (i.e. growth rate) of steelhead in Imnaha River will be improved to exceed the 5% extinction-risk (viability) curves developed by the ICTRT (e.g., ~ 1,000 spawners at a productivity of 1.15).
- Habitat Productivity and Capacity (provided by biologist working in the Imnaha) :
Imnaha - Productivity: 3; Capacity: 1,800; Little Sheep - Productivity: 3; Capacity: 200

2.2 Current Hatchery Programs Affecting this Population

The Imnaha summer steelhead hatchery program releases up to 330,000 yearling juveniles to Big Sheep and Little Sheep creeks to return 2,000 adults for harvest, broodstock, and natural escapement. Smolts are transported from Irrigon Hatchery to the Little Sheep acclimation facility or are direct-planted in Big Sheep Creek. Co-managers determine the release size based on program performance. These range from 165,000 to 230,000 in Little Sheep Creek and from 50,000 to 100,000 in Big Sheep Creek. Releases include both fish targeted for harvest and natural production. All fish are marked with an adipose fin-clip.

Broodstock for the program is collected at the Little Sheep adult trap. Adults surplus to broodstock needs and in excess of natural spawning escapement needs are transported for release in Big Sheep Creek. Fish are spawned at the Little Sheep Creek facility and incubated initially at the Wallowa Hatchery. Eyed eggs are then transferred to the Irrigon Hatchery where all juvenile rearing occurs.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated programs: None outside the Little Sheep/Big Sheep tributaries; 212 fish in Little Sheep/Big Sheep tributaries
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 9 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 2.7 to 2.8. Average abundance of natural-origin spawners (NOS) would increase from approximately 1180 fish to approximately 1210 fish. The harvest contribution of the natural and hatchery populations would go from approximately 122 fish to approximately 125 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Imnaha summer steelhead that emphasizes maintaining existing natural spawning populations as well as using hatchery-origin steelhead in an attempt to augment natural production. Currently the integrated hatchery program in Little Sheep Creek is not operated consistent with the HSRG-defined standards of a Primary or Contributing population.

The total production objective for this program is to release up to 330,000 smolts derived from hatchery and natural-origin returns. The program is partial fulfillment of the LSRCP adult return goal of 11,200 adult steelhead to the project area. The current program size is approximately 215,000 smolts. Broodstock for the program is collected at the Little Sheep adult trap. Adults surplus to broodstock needs and in excess of natural spawning escapement needs are transported for release in Big Sheep Creek. Fish are spawned at the Little Sheep Creek facility and incubated initially at the Wallowa Hatchery. Eyed eggs are then transferred to the Irrigon Hatchery where juvenile rearing occurs. Smolts are transported from Irrigon Hatchery to the Little Sheep acclimation

facility. This hatchery program also exports smolts (up to 50,000 for a direct plant) and pre-spawn adults to Big Sheep Creek. No hatchery program operates in the Imnaha River outside of these tributaries.

The proportion of natural-origin fish in the hatchery broodstock and proportion of the natural spawning population made up of hatchery –origin fish are managed based on a sliding scale based on the number of natural-origin adults returning to the habitat.

Recommendations

The managers should identify specific conservation objectives for the Big Sheep Creek steelhead component of the Imnaha steelhead population. In order to accomplish this, managers need to develop abundance and productivity estimates for this population component and determine the current population status. Managers should suspend the existing smolt and adult plants into Big Sheep Creek until the above has been achieved.

Once that is complete, a properly integrated program (using either adult or juvenile outplants) should be developed using the appropriate PNI, pNOB and pHOS to achieve the conservation standards developed by the managers.

Until then, the HSRG recommends that managers develop a 2-stage stepping stone program released into Little Sheep Creek only. The program would consist of an integrated conservation component producing approximately 87,000 smolts (PNI = 0.5; pNOB = 65%; pHOS = 65%). This component initially would be produced by collecting 100% of its broodstock from natural-origin returns. Subsequent generations would be maintained by collecting 65% of the broodstock from natural-origin returns and 35% from hatchery origin returns from this component. Excess hatchery-origin returns from the conservation component would provide all broodstock to maintain an additional second stage harvest component of approximately 126,000 smolts. Unharvested hatchery returns from the harvest component would not be used for broodstock. This would require differential marking of juveniles from the two programs. For example, the juveniles from the conservation program would be coded-wire tagged only, while the harvest program fish would be adipose-marked and coded-wire tagged.

This solution would require an ability to collect natural-origin adults in the appropriate number and removal of at least 70% of the unharvested hatchery-origin returns.

The HSRG notes that there is a general lack of information about steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. Efforts should be made to improve this information base.

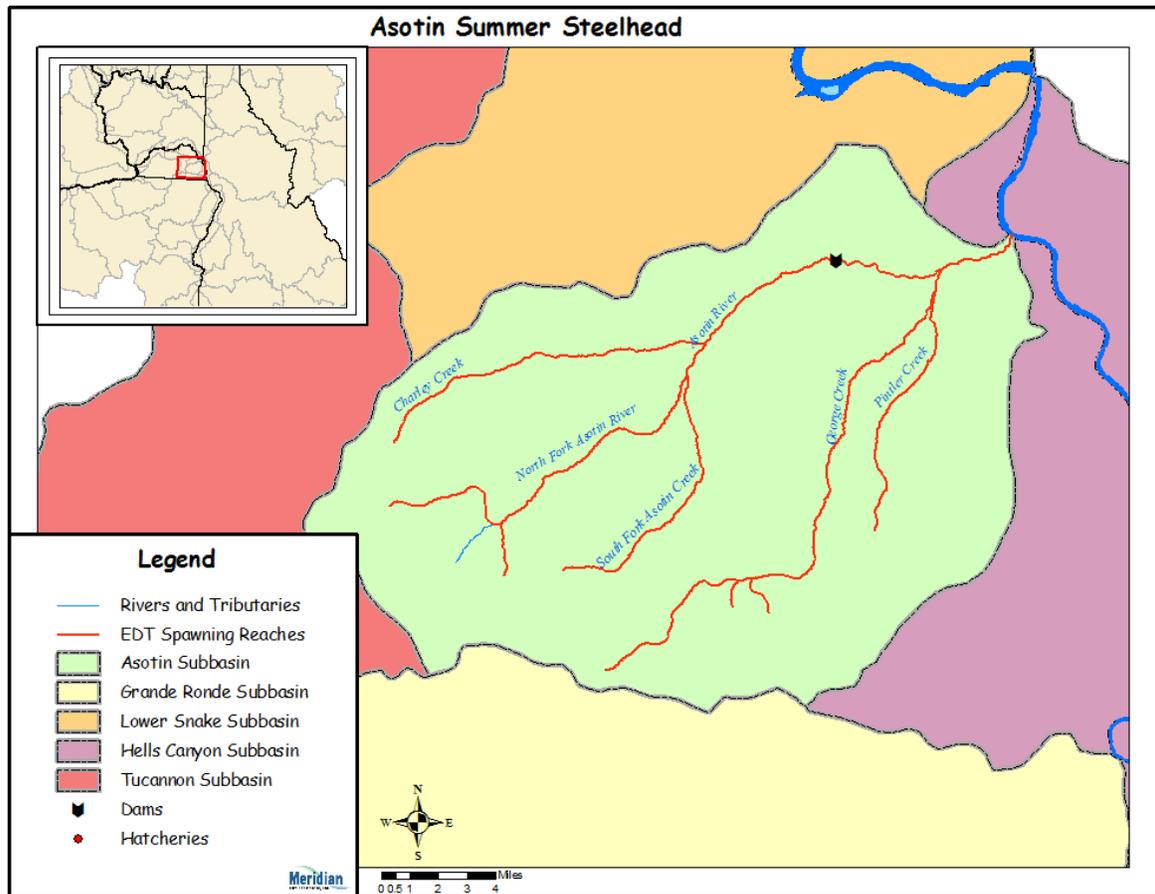
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Imnaha Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|----------------------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 1% | 0.00 | 1,177 | 2.7 | 122 | 0 |
| | Little Sheep Int Harv | 212.3 | 70% | 0% | 65% | 0.13 | 91 | 1.4 | 1,359 | 387 |
| | Seg Harv | - | 0% | 0% | 0% | | | | - | - |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 1,208 | 2.8 | 125 | - |
| | Little Sheep None | - | 0% | 0% | 0% | 1.00 | 128 | 2.7 | 13 | - |
| HSRG Solution | None None | - | 0% | 0% | 0% | 1.00 | 1,195 | 2.8 | 124 | 0 |
| | Little Sheep Int Harv | 87.7 | 70% | 0% | 65% | 0.50 | 90 | 1.8 | 570 | 116 |
| | Stepping Stone Seg Harv | 126.3 | 70% | | | | | | 802 | 296 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 0% | 1.00 | 1,386 | 3.1 | 144 | 0 |
| | Little Sheep Int Harv | 87.7 | 70% | 0% | 61% | 0.52 | 106 | 2.0 | 572 | 188 |
| | Stepping Stone Seg Harv | 126.3 | 70% | | | | | | 802 | 296 |

Hatchery Scientific Review Group Review and Recommendations

Asotin Creek Summer Steelhead (A-Run) Population and Related Hatchery Programs

January 31, 2009



1 Asotin Creek Summer Steelhead (A-run)

The Asotin Creek steelhead population is part of the Snake River Basin Steelhead Distinct Population Segment (DPS) that includes all naturally spawned populations of steelhead in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (62 FR 43937; August 18, 1997). The DPS has six major population groupings (MPGs): Lower Snake River, Clearwater River, Grande Ronde River, Salmon River, Hells Canyon, and the Imnaha River (ICTRT 2006), and contains both A and B-run steelhead (based on migration timing, ocean-age and adult size). The Asotin Creek population is an A-run, and is included in the Lower Snake River MPG.

Several artificial propagation programs are considered part of the DPS: the Tucannon River natural stock, the North Fork Clearwater River stock reared at Dworshak National Fish Hatchery (NFH) and Clearwater Fish Hatchery and released in the Clearwater and Salmon Rivers¹, East Fork Salmon River local stock, and the Little Sheep Creek/Imnaha River Hatchery steelhead hatchery programs. The DPS was listed as a threatened under the ESA on August 18, 1997; this status was reaffirmed on January 5, 2006.

The Interior Columbia Technical Recovery Team (ICTRT) classified the Asotin Creek population as “Basic” based on historical habitat potential. A steelhead population classified as Basic has a mean minimum abundance threshold of 500 naturally produced spawners with sufficient intrinsic productivity to achieve a 5% or less risk of extinction over a 100-year timeframe.

According to the Draft Snake River Steelhead Recovery Plan, Snake River steelhead enter fresh water from June to October and spawn the following spring from March to June. Emergence occurs by early June in low elevation streams and as late as mid-July at higher elevations. Snake River steelhead usually smolt at age 2 or age 3 years and reside in marine waters for 1 to 2 years prior to returning to their natal stream to spawn at 3 to 5 years of age.

EDT modeling of historic steelhead production indicates that the stream may have produced over 2,500 adults.

2 Current Conditions

Steelhead spawning has been observed in the upper mainstem Asotin Creek and in several tributaries (George Creek, Pintler Creek, Charlie Creek, and the North and South Forks). This population also includes steelhead in Alpowa, Almota, Steptoe, Tenmile and Couse creeks. Juvenile steelhead rearing has been documented in most of the Asotin Creek drainage that is accessible to adult migration, as well as in the accessible portions of those other drainages listed above.

In 2006, 477 adult steelhead were recorded at the adult trap on Asotin Creek. Of the fish captured, 34 were of hatchery origin. Based on trap efficiency values, WDFW estimated that 555 adults spawned in the stream above the trap site that year. This excludes three miles of mainstem Asotin Creek, all of the George Creek drainage, and Almota, Alpowa, etc. Large numbers of kelts were also collected at the trap post-spawning.

¹ Artificial propagation programs for steelhead in the Clearwater River subbasin are based on the North Fork Clearwater stock which was trapped at the foot of Dworshak Dam when access to the North Fork was blocked in 1969.

Approximately, 2% of the female adult steelhead were repeat spawners. There were no male repeat spawners (WDFW 2007).

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Asotin Creek steelhead population.

- **ESA Status:** The Snake River basin steelhead DPS was listed as threatened on August 18, 1997; the threatened status was reaffirmed on January 5, 2006.
- **Population Description:** The ICTRT classified the Asotin Creek population as “Basic” based on historical habitat potential (ICTRT 2005). For the HSRG review, the population has been classified as Primary.
- **Recovery Goal for Abundance:** 500
- **Productivity Improvement Expectation:** The 100-year geometric mean for abundance and productivity (i.e. growth rate) of A-run steelhead in Asotin Creek will be improved to exceed the 5% extinction-risk (viability) curves developed by the ICTRT (e.g., ~ 500 spawners at a productivity of 1.3).
- **Habitat Productivity and Capacity:** Productivity: 2.5 ; Capacity: 1,400

2.2 Current Hatchery Programs Affecting this Population

Currently, there are no hatchery programs for steelhead in the Asotin Creek. The stream is reserved by WDFW for natural steelhead production only.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from in-basin integrated programs: 0
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 75
- Above the Asotin trap, there were 34-53 strays in 2008. Nearly 50% of the 2008 Alpowa population were hatchery strays.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager’s goals consistent with

the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.3 to 2.3. Average abundance of natural-origin spawners (NOS) would increase from approximately 354 fish to approximately 817 fish. The harvest contribution of the natural and hatchery populations would go from approximately 38 fish to approximately 87 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have not assigned a population designation for the Asotin Creek summer steelhead. Currently this population is managed for natural production but is consistent with the standards of a Contributing population (pHOS is less than 0.10). This is a small population that includes Asotin Creek and several other small tributaries to the Snake River. There is no hatchery program associated with this population; however, a high proportion of hatchery strays have been observed in the tributaries.

Recommendations

If managed as a Primary or Contributing population, methods will be required to control hatchery strays. The managers need to improve the information base about this population.

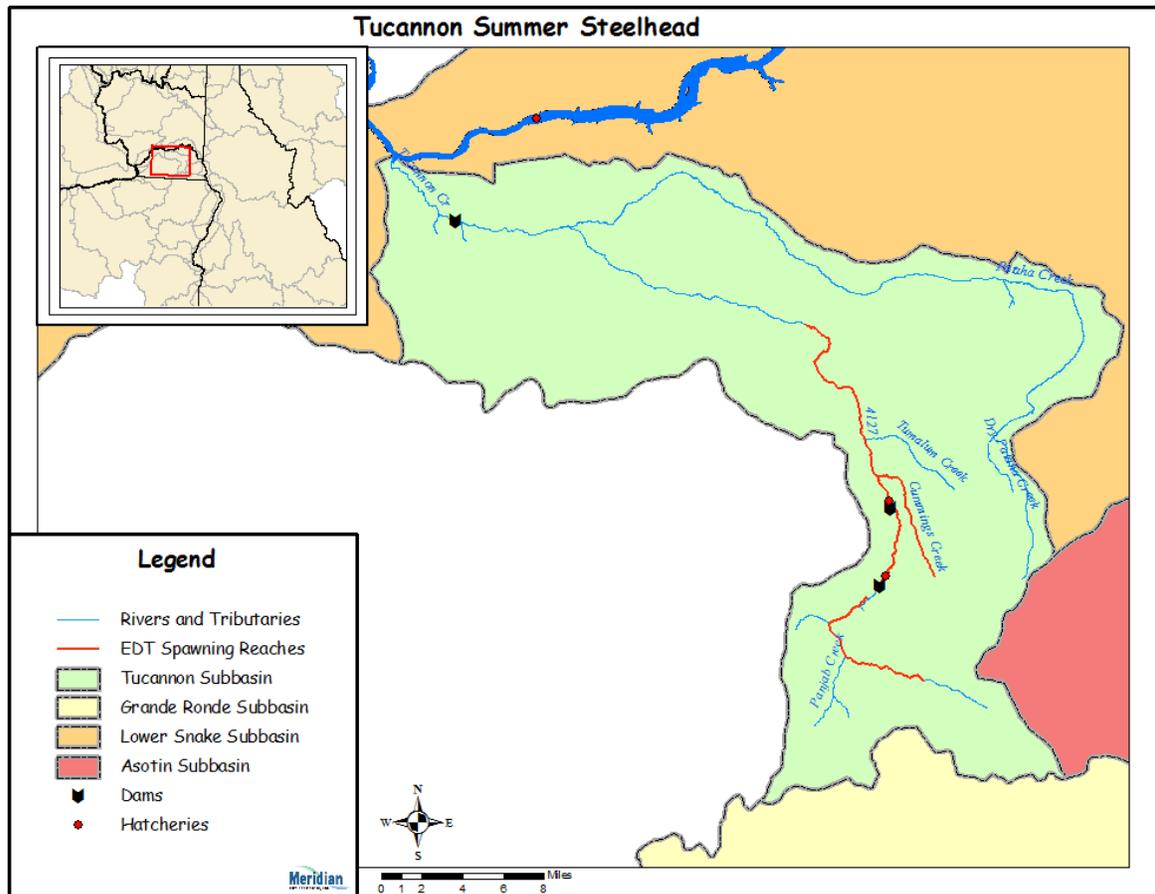
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Asotin Creek Summer Steelhead. The yellow row indicates the natural population and light green indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | 0.0 | 0% | 0% | 9% | 0.00 | 354 | 1.3 | 38 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | 0.0 | 0% | 0% | 0% | 1.00 | 817 | 2.3 | 87 | - |
| HSRG Solution | None None | 0.0 | 0% | 0% | 1% | 0.00 | 750 | 2.1 | 80 | 0 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | None None | 0.0 | 0% | 0% | 1% | 0.00 | 1683 | 2.4 | 179 | 0 |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Tucannon River Summer Steelhead A-Run Population and Related Hatchery Programs

January 31, 2009



1 Tucannon River Summer Steelhead

This population is considered part of the Snake River Steelhead ESU that is classified as threatened under the Endangered Species Act. Steelhead populations in the ESU include all naturally spawned fish in the Tucannon, Clearwater, Grande Ronde, Imnaha and Salmon rivers and Asotin Creek.

The Interior Columbia Technical Recovery Team (ICTRT) classified this population as “Intermediate”. An “Intermediate” population is one that requires a minimum abundance of 1,000 wild spawners and an intrinsic productivity greater than 1.15 recruits per spawner (R/S) to meet the 5% extinction risk criteria established by the ICTRT.

Historically, it was estimated that over two million steelhead returned to the Columbia River Basin, with about 25% of these originating from the Snake River. Ice Harbor Dam counts indicate that over 100,000 steelhead returned to the Snake River in the early 1960s. There are no reliable estimates of the percentage of fish that historically have returned to the Tucannon River, however, EDT modeling of historic habitat conditions indicates the subbasin may have supported over 6,000 adult steelhead (Draft Snake River Recovery Plan 2007). WDFW has suggested historic run sizes on the order of 3,400 fish.

2 Current Conditions

This population includes the Tucannon River, and the nearby Alkali Flat Creek, Penawawa Creek, Deadman Creek, and Meadow Creek (Snake River Recovery Plan 2007). Spawning occurs from mid-February through mid-May. Juveniles emigrate from the system in the spring at ages 1-4, the majority at age 1 and 2. Spawners include both natural- and hatchery-origin fish. Hatchery fish (Lyons Ferry stock of 100,000 smolts and Tucannon River stock of 50,000 smolts) are released into the Tucannon River annually.

Fish enter the Tucannon River as early as July and as late as the following April. Spawning has been observed from RM 3 upstream to RM 52, and in Tualum, Cummings, Little Tucannon, Pataha and Panjab creeks. Hatchery and natural fish enter and spawn concurrently throughout the subbasin, although most of the Lyons Ferry stock hatchery fish concentrate in the lower river where they were released in recent years, some of the Tucannon River Endemic stock return to at least the Tucannon Fish Hatchery weir/trap. The remaining fish may spawn anywhere from 0-20 miles below that point. Anecdotal observations of hatchery fish (believed to be Lyons Ferry stock) spawning as early as January have been reported from the lower river.

Adult escapement to the Tucannon River has been approximately 445 fish (1990-2007). The abundance of natural-origin fish over that same time period has been estimated at only 150 adults. The remaining 295 adults were of hatchery-origin (Lyons Ferry stock or Tucannon River endemic stock).

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Snake River steelhead are listed as threatened under ESA.
- Population Description: The ICTRT classifies this population as Intermediate. For the HSRG review, the population has been classified as Primary.
- Recovery Goal for Abundance: 1,000 fish

- Productivity Improvement Expectation: Increase to 1.15 over time as habitat actions designed to improve the abundance and productivity of ESA listed steelhead and Chinook are implemented in the basin.
- Habitat Productivity and Capacity: Productivity: 1.8; Capacity: 275

2.2 Current Hatchery Programs Affecting this Population

Summer steelhead hatchery fish released to the subbasin come from integrated and segregated programs operated out of the Lyons Ferry Hatchery.

The segregated harvest program releases approximately 100,000 smolts (4-5 fpp; Lyons Ferry Hatchery stock) to the Tucannon River (RM 11) on an annual basis. Fish are not acclimated prior to release as studies conducted in the 1990s showed higher survival rates for direct releases in the lower river than for acclimated releases higher in the basin. All fish released are marked with an adipose fin-clip. A portion of those (20,000) are also given a left-ventral clip and coded wire-tag for production monitoring. In recent years a portion have also been PIT-tagged. Broodstock for the segregated program is collected at Lyons Ferry Hatchery. All egg incubation and juvenile rearing occurs at this facility. Fish are reared in a combination of standard concrete raceways and a 2.1-acre rearing pond located at Lyons Ferry Hatchery. This program may be terminated depending on the success of the integrated program discussed below.

The integrated program uses Tucannon River natural-origin fish (i.e. unmarked/untagged adults) as broodstock. From 2000 to 2007, adults were collected at a temporary weir located at RM 11 on the Tucannon River. At this site, surplus adults (hatchery- and natural-origin) were released above the weir to provide a recreational fishery (hatchery fish only) and to support natural production. In 2008, the temporary trap was moved upstream to RM 25. This was done to reduce the likelihood of collecting unmarked adults for the broodstock that were direct offspring from Lyons Ferry stock fish spawning in the lower Tucannon River near the old trap site. The new trap location is also being used as a management point where Lyons Ferry stock fish will no longer be passed upstream to spawn in the river.

Fish collected at the temporary adult trap, or from the Tucannon Fish Hatchery adult trap (RM 37) are hauled to Lyons Ferry Hatchery for holding and spawning. Egg-incubation and early rearing occurs at Lyons Ferry Hatchery. Fish are transferred to the Tucannon Hatchery in February. Currently, about 50,000 smolts are released to the river near RM 41. If this program is successful, the long-term goal is to eliminate the segregated program and release a maximum of 150,000 yearlings (4-5 fpp) each year. With full implementation of the program, a portion of the releases will be adipose fin-clipped for targeting by fisherman (the objective is to fulfill a mitigation responsibility). The remainder will be unmarked to allow adult escapement targets to be met.

The program has an R/S value of 17.3 (1989-2002 Brood Year Average), which includes spawned adults that may have been culled due to IHNV.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 174 (last 3-4 years)
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 448
- Hatchery and wild steelhead from the Tucannon River are straying to streams upstream of Lower Granite Dam.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 1.2 to 1.6. Average abundance of natural-origin spawners (NOS) would decrease from approximately 149 fish to approximately 112 fish. The harvest contribution of the natural and hatchery populations would go from approximately 2,416 fish to approximately 11 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Lyons Ferry Hatchery (LFH) and Tucannon Fish Hatchery (TFH) were built/modified under the Lower Snake River Fish and Wildlife Compensation Plan to compensate for the annual loss of summer steelhead caused by hydroelectric projects on the Snake River.

The Lyons Ferry Hatchery Complex currently uses four summer steelhead stocks to produce smolts for release into the Snake (60,000 smolts of LFH stock), Tucannon (100,000 smolts of LFH stock, 50,000 smolts of Tucannon Endemic stock), Grande Ronde (160,000 smolts of Wallowa stock), Walla Walla (100,000 smolts of LFH stock), and Touchet rivers (85,000 smolts of LFH stock, 50,000 smolts of Touchet Endemic stock) to enhance recreational opportunities for steelhead anglers and for recovery purposes. All steelhead smolts for the program are planned for a release size of 4.5 fpp (about 100 g/fish). Current releases of summer steelhead smolts are lower than originally specified by the LSRCP program. Releases have periodically been reduced through the years (in 2001 the LFH and Wallowa stock programs were reduced by 37%) in partial response to Endangered Species Act (ESA) concerns and documented smolt-to-adult (SAR) survival rates far exceeding the original SAR goal of 0.5% (USACE 1975; Lyons Ferry Complex Hatchery Evaluation: Summer Steelhead Annual Report 2005 Run Year June 2007).

The Tucannon summer steelhead population is an endemic population and has been designated as a Primary population, although currently it is not meeting the standards for this designation. Managers have documented that a high proportion (50% or more) of returning adults bypass the Tucannon River and stray above Lower Granite Dam. This pattern is documented in both the hatchery- and natural-origin fish. It is unknown if these fish contribute to any population, but WDFW has documented Tucannon River steelhead in Asotin, Alpowa and an unnamed tributary above Lower Granite Dam.

Genetic sampling has shown that the segregated Lyons Ferry hatchery fish have introgressed with the endemic population. Lyons Ferry stock (100,000 smolts) is directly released into the lower Tucannon River.

We observe that a high number of hatchery-origin fish spawn naturally in the lower portion of the Tucannon subbasin. Habitat productivity and capacity are low and the population is receiving some demographic benefit from hatchery production.

Recommendations

In order to improve fitness and limit genetic introgression, managers should eliminate releases of Lyons Ferry stock in the Tucannon.

In addition, the recommendations described below are intended to provide a short-term conservation strategy. When population productivity and capacity have increased, the managers should transition this program to meet the standards of a Primary population (PNI greater than 0.67 and pHOS less than 47%).

In the near term, the HSRG recommends that managers continue to operate the current endemic program (50,000 smolts, pNOB 100%). Managers should consider demographic risks to the population and modify their protocols during periods of low abundance. The HSRG acknowledges that managing for the recommended PNI values may not be possible or appropriate in the near term when abundance levels are low and demographic risks to the population increase. To address this concern, managers should develop a variable sliding scale for managing both pNOB and pHOS.

An example of such a sliding scale would look like this:

Each year, depending on NOR run size, pNOB and pHOS are allowed to “float” or slide. The HSRG assumes managers will establish an acceptable level of removal of NORs for use in the hatchery brood. This will be a fixed percentage of the total NOR return (say 40%) and will not change, regardless of NOR return. In years of high NOR abundance, this 40% could make up 100% of the needed hatchery brood (pNOB= 100%). In that case, no HORs would be used in the hatchery brood. Hatchery fish can be allowed to reach the spawning ground (pHOS) if needed to achieve an appropriate number of fish spawning naturally (demographic benefit and use of available habitat). This however, would not be required during years of very high NOR returns as both objectives (pNOB and natural spawning) may be met with NORs.

In years of low NOR abundance, the same 40% of the NOR return would be removed for use in the hatchery brood (pNOB). However, in these years, that 40% may make up only a small part of the needed brood (i.e. pNOB 10%). In these years, enough HORs should be used to achieve needed hatchery brood and additional HORs should be allowed to spawn naturally (pHOS) to achieve the minimum acceptable level of naturally spawning.

The goal of this sliding scale is to achieve an “average” PNI over time of the desired level (0.67 or 0.5) depending on the population designation even though it may not be achieved in any one year. A good way to determine the level of NORs that should be removed each year (see above) is to review the return of NORs over a long time frame and iterate what level (30, 40, 50%) are needed, on average, to achieve the desired PNI.

Managers should investigate ways to address the problem of adults straying above Lower Granite Dam. Unless this straying problem is solved, it appears unlikely that this population can meet the abundance standards for a Primary population. If this problem is addressed, a number of other options exist, including harvest or increasing the program.

The HSRG encourages managers to explore opportunities to increase the harvest contribution, such as increasing daily bag limits. The HSRG supports alternate uses of surplus fish such as distribution to local food banks and/or stream nitrification.

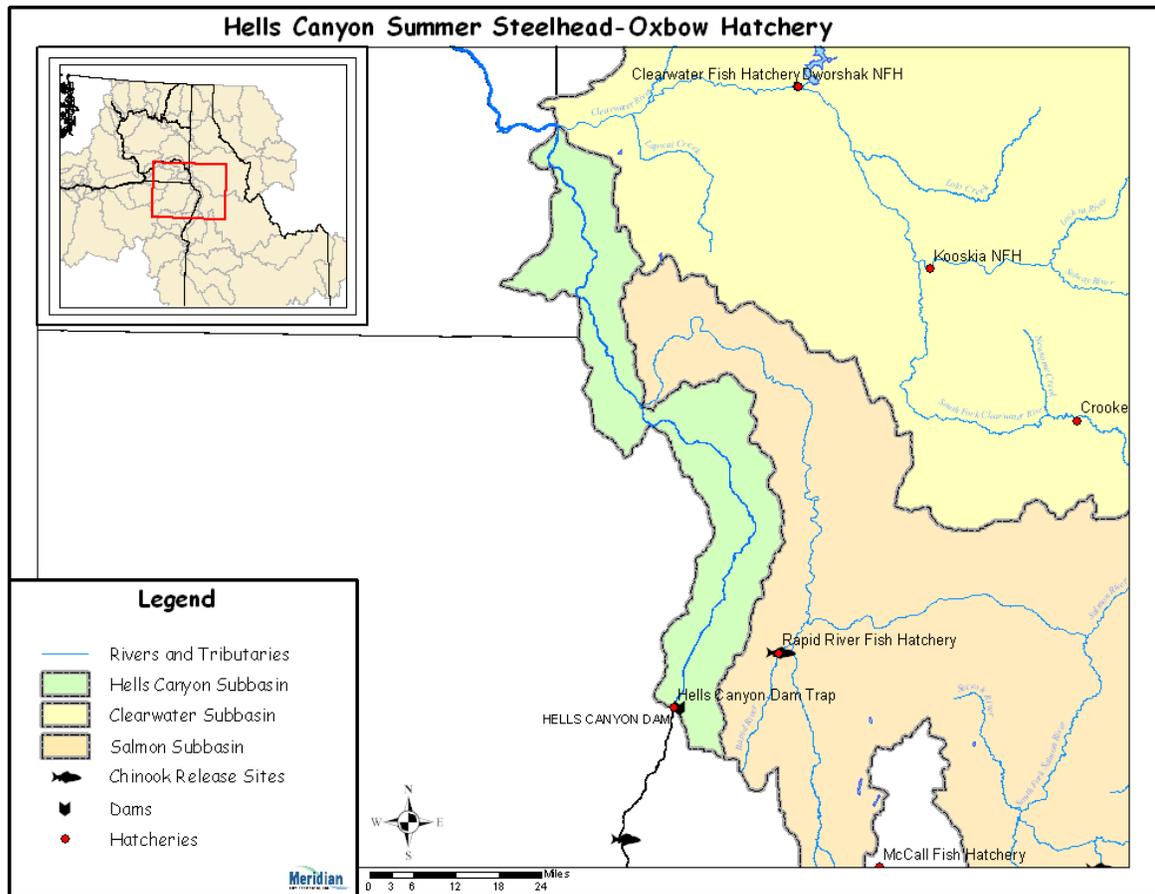
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Tucannon River Summer Steelhead. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int Cons | 50.9 | 75% | 0% | 70% | 0.59 | 149 | 1.2 | 91 | 526 |
| | Seg Harv | 100.7 | 12% | | | | | | 2,325 | 106 |
| No Hatchery | None None | 0.0 | 0% | 0% | 0% | 1.00 | 112 | 1.6 | 11 | - |
| HSRG Solution | Int Cons | 50.9 | 85% | 0% | 48% | 0.68 | 99 | 1.3 | 86 | 596 |
| | Seg Harv | 0.0 | 12% | | | | | | 0 | - |
| HSRG Solution w/ Improved Habitat | Int Cons | 50.9 | 85% | 0% | 42% | 0.70 | 124 | 1.5 | 88 | 596 |
| | Seg Harv | 0.0 | 12% | | | | | | 0 | - |

Hatchery Scientific Review Group Review and Recommendations

Snake Hells Canyon Summer Steelhead (A-run) Population and Related Hatchery Programs

January 31, 2009



1 Snake Hells Canyon Summer Steelhead (A-run)

The Snake Hells Canyon Summer Steelhead (A-run) population is part of the Snake River Basin Steelhead Distinct Population Segment (DPS) that includes all naturally spawned populations of steelhead in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho (62 FR 43937; August 18, 1997). Several artificial propagation programs are considered part of the DPS: the Tucannon River natural stock, the North Fork Clearwater River stock reared at Dworshak National Fish Hatchery (NFH) and Clearwater Fish Hatchery and released in the Clearwater and Salmon rivers¹, East Fork Salmon River local stock, and the Little Sheep Creek/Imnaha River Hatchery steelhead hatchery programs. The DPS was listed as a threatened under the ESA on August 18, 1997; this status was reaffirmed on January 5, 2006.

According to the ICTRT, the DPS has six major population groupings (MPGs): Lower Snake River, Clearwater River, Grande Ronde River, Salmon River, Hells Canyon, and the Imnaha River (ICTRT 2006).

The Hells Canyon MPG contains four steelhead populations, but three (Powder River, Burnt River and Weiser River) are extirpated. A few steelhead occupy some tributaries within Hells Canyon, a population that is considered functionally extirpated. However, the Hells Canyon tributary region is now designated as a component of the Wildhorse-Powder population, and belongs to the Hells Canyon MPG.

Snake River Basin steelhead trout enter fresh water from June to October and spawn during the following spring from March to May. Emergence occurs by early June in low elevation streams and as late as mid-July at higher elevations. Snake River steelhead usually smolt at age-2 or age-3 and reside in marine waters for 1 to 3 years prior to returning to their natal stream to spawn at 4 or 5 years of age.

There are no estimates of historical steelhead abundance in the Hells Canyon MPG.

2 Current Conditions

As noted above, a small number of steelhead occupy some tributaries within the Hells Canyon, although the population is considered functionally extirpated since most of the historic spawning and rearing habitat is upstream of Hells Canyon Dam.

A segregated harvest hatchery program is operated at Niagara Springs and Oxbow hatcheries (see below) to provide mitigation for production lost due to the construction of the Hells Canyon Complex.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the Snake Hells Canyon steelhead population.

- **ESA Status:** The Snake River Basin steelhead DPS was listed as threatened on August 18, 1997; the threatened status was reaffirmed on January 5, 2006.
- **Population Description:** For the purpose of this review, the HSRG assigned this population as Stabilizing. The population currently meets the broodstock criteria for this population designation.

¹ Artificial propagation programs for steelhead in the Clearwater River subbasin are based on the North Fork Clearwater stock trapped at the base of Dworshak Dam when construction blocked access to the North Fork in 1969.

- Recovery Goal for Abundance: NA
- Productivity Improvement Expectation: NA
- Habitat Productivity and Capacity: Productivity: 2; Capacity: 500

2.2 Current Hatchery Programs Affecting this Population

One summer steelhead hatchery program at the Oxbow Fish Hatchery has the potential to affect this population. Adult steelhead are trapped immediately downstream of Hells Canyon Dam (downstream of Oxbow Dam) and trucked to Oxbow Hatchery. The majority of adults are trapped in the fall (90%). Spawning and egg incubation to the eyed-stage of development occurs at the Oxbow Hatchery (an Idaho Power facility). No natural-origin fish are incorporated in the broodstock design. Natural-origin adults trapped at Hells Canyon are returned to the river downstream of the dam. Final incubation and rearing occur at Niagara Springs Hatchery (also an Idaho Power facility). The program's goal for the Snake River (a segregated harvest program) is to release approximately 525,000 A-run steelhead smolts (4.5 fpp) into the Snake River below Hells Canyon Dam. All smolts are 100% adipose fin clipped (30,000 receive coded wire-tags and 300 receive PIT tags). The program has an R/S of 12.6.

The first priority for this program is to produce eggs to meet the mitigation goal for smolt releases to the Snake River downstream of Hells Canyon Dam (525,000 smolts) and to the Little Salmon River (275,000 smolts). Approximately 900 fall-trapped adults are over-wintered at the Oxbow Hatchery and spawned in the spring to satisfy these releases.

A second priority for this program is to provide adult steelhead to the Idaho Fish and Game (IDFG) and Oregon Department of Fish and Wildlife (ODFW) for recreational fisheries in blocked areas upstream of the Hells Canyon complex and to the Nez Perce Tribe as a subsistence program. The IDFG fraction (up to 1,000 adults) is generally released in the Boise River. The ODFW fraction (up to 1,000 adults) is generally released in Hells Canyon pool. The Nez Perce fraction (up to 1,000 adults) is incorporated in their food distribution network.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: NA
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 388 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater

than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would increase from 0.9 to 1.8. Average abundance of natural-origin spawners (NOS) would increase from approximately 209 fish to approximately 222 fish. The harvest contribution of the natural and hatchery populations would go from approximately 3,718 fish to approximately 26 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The majority of the historic habitat for this population is no longer accessible. Managers have identified a strategy for this population that emphasizes maintaining the current hatchery mitigation program. For the purposes of this analysis, the HSRG assumed this population to be Stabilizing, and this segregated harvest program is operating consistent with the HSRG-defined standards of a Stabilizing population.

This program supplies 525,000 smolts for release to the Snake River downstream of Hells Canyon Dam. The program is partial fulfillment of the Idaho Power Company mitigation responsibility. In addition, this program generates 275,000 smolts for the Little Salmon River (in a different population zone). Adult steelhead are trapped immediately downstream of Hells Canyon Dam (downstream of Oxbow Dam) and trucked to Oxbow Hatchery. The majority of adults are trapped in the fall (90%). Spawning and egg incubation to the eyed-stage of development occurs at the Oxbow Hatchery (an Idaho

Power facility). No natural-origin fish are incorporated in the broodstock design. Natural-origin adults trapped at Hells Canyon are returned to the river downstream of the dam. Final incubation and rearing occur at Niagara Springs Hatchery (also an Idaho Power facility).

This program provides a significant annual terminal harvest contribution. It provides adult steelhead to the IDFG and ODFW for recreational fisheries in blocked areas upstream of the Hells Canyon complex and to the Nez Perce Tribe as a subsistence program. The IDFG fraction (up to 1,000 adults) is generally released in the Boise River. The ODFW fraction (up to 1,000 adults) is generally released in Hells Canyon pool. The Nez Perce fraction (up to 1,000 adults) is incorporated in their food distribution network.

Recommendations

The HSRG has no specific recommendations for this hatchery program.

The HSRG encourages managers to explore opportunities to increase the harvest contribution, such as increasing daily harvest limits.

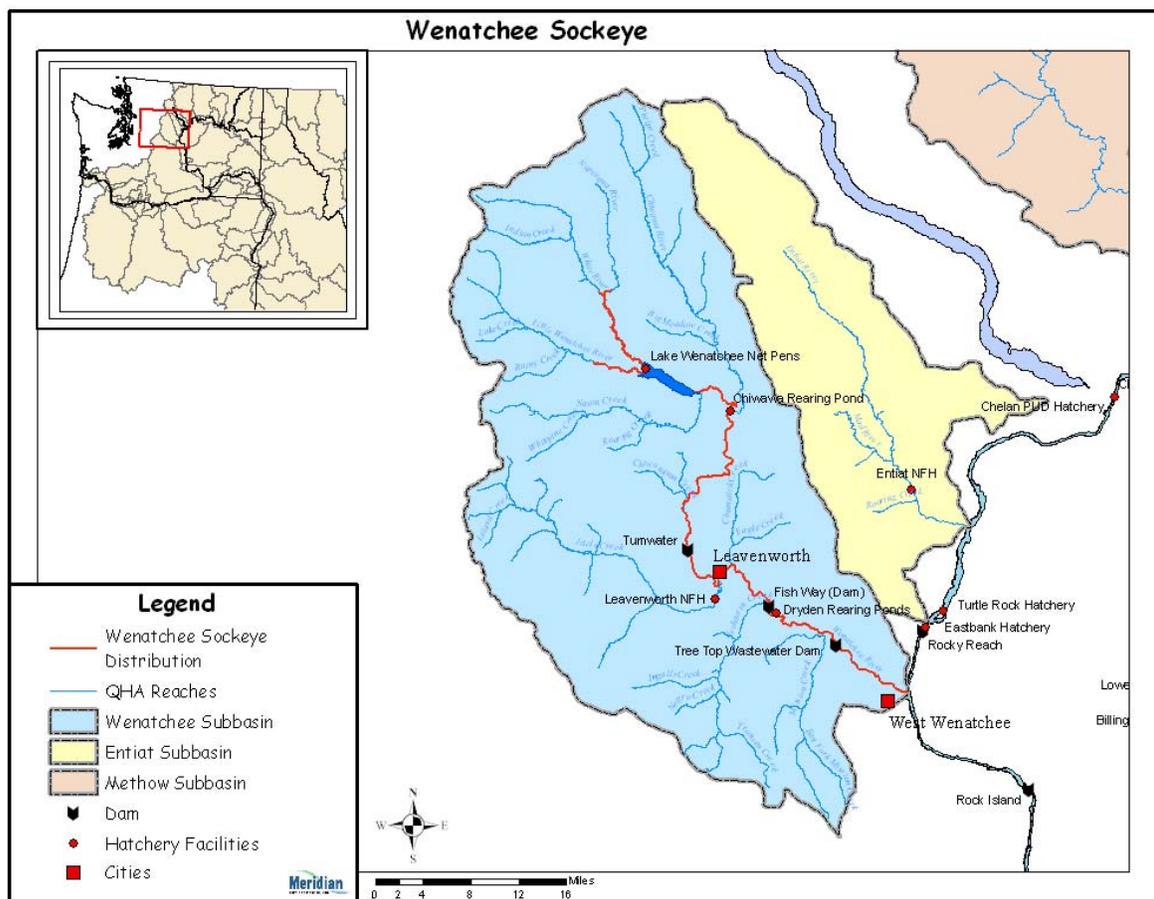
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Hells Canyon Summer Steelhead (A-run). The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | None None | - | 0% | 0% | 45% | 0.00 | 209 | 0.9 | 24 | 0 |
| | Seg Harv | 525.4 | 95% | | | | | | 3,694 | 1,403 |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.00 | 222 | 1.8 | 26 | - |
| HSRG Solution | None None | - | 0% | 0% | 27% | 0.00 | 130 | 0.9 | 15 | 0 |
| | Seg Harv | 525.4 | 95% | | | | | | 3,602 | 777 |
| HSRG Solution w/ Improved Habitat | None None | - | 0% | 0% | 24% | 0.00 | 152 | 1.0 | 17 | 0 |
| | Seg Harv | 525.4 | 85% | | | | | | 3,602 | 655 |

Hatchery Scientific Review Group Review and Recommendations

Wenatchee Sockeye Population and Related Hatchery Programs

January 31, 2009



1 Wenatchee River Sockeye

Wenatchee sockeye are one of the two viable sockeye populations remaining in the Columbia River. Adult sockeye spawn in the White and Little Wenatchee rivers, with juvenile rearing in Lake Wenatchee.

Historically it is believed that sockeye runs to the upper Columbia River Basin numbered in the hundreds of thousands each year. Accurate estimates of historical sockeye abundance are not available however, as these runs were substantially reduced by harvest activities by the early 20th century (NPPC 2004).

2 Current Conditions

Wenatchee sockeye adults begin entering the Wenatchee River subbasin in late June. Spawning occurs in September primarily in the lower four miles of the Little Wenatchee River and lower five miles of the White River. Some sockeye may also spawn in the Napeequa River, a small tributary of the White River. Fry enter Lake Wenatchee between March and April of the next year. Sockeye smolts leave Lake Wenatchee to begin their migration to the ocean in April as age-1 or age-2 smolts.

Counts at Rock Island Dam indicate that adult sockeye escapement past this facility has averaged ~55,000 fish since 1998. This number includes fish destined for both the Wenatchee and Okanogan rivers. A comparison of counts at Rock Island and Wells Dam (upstream of the Wenatchee River) indicates that adult sockeye escapement to the Wenatchee River is about 15,000 fish.

A total of 200,000 sub-yearling hatchery sockeye are released in July to net pens in Lake Wenatchee. Fish are released from net pens in October or November.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Not Listed
- Population Description: A composite stock of both natural and hatchery-origin fish.
- Recovery Goal for Abundance: Not Applicable
- Productivity Improvement Expectation: Unknown
- Habitat Productivity and Capacity: Productivity: 10.0 ; Capacity: 15,000 (both are iterated values)

2.2 Current Hatchery Programs Affecting this Population

A brief description of the Lake Wenatchee sockeye program is presented below.

Lake Wenatchee Sockeye: The program releases 200,000 sub-yearling sockeye to Lake Wenatchee each year. Juveniles are released to net pens in July, where they are held through late October or early November. Fish are then released from the net pens to the lake at approximately 10-25 fpp. All hatchery juveniles released are adipose fin-clipped. A portion may be marked with PIT-tags or coded-wire tags. Broodstock for the program are collected at the Tumwater Dam trapping facility from the run at large. Only wild sockeye salmon are used as broodstock. Adults are transported to net pens located in Lake Wenatchee for holding and spawning. Eggs are then transferred to the Eastbank Hatchery for fertilization and incubation. Juveniles are reared at the hatchery until they

reach 100 fpp, then are transferred to the Lake Wenatchee net-pens in July. In the past, some juvenile sockeye were released directly to the White River.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 66
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: Unknown

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated Adjusted Productivity (with harvest and fitness factor effects from AHA) would be unchanged at 10.0. Average abundance of natural-origin spawners (NOS) would increase from approximately 14,803 fish to approximately 15,030 fish. Harvest contribution of the natural and hatchery populations would be zero.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

The Managers have stated their goal for this program as; “Increase the abundance of the natural adult population of unlisted species, while ensuring appropriate spatial distribution, genetic stock integrity, and adult spawner productivity. In addition, provide harvest opportunities in years when spawning escapement is sufficient to support harvest.” (Goal statement adopted by Habitat Conservation Plan Committee, Hatchery Sub-Committee). To achieve this, the current program collects approximately 200 natural-origin adults at Tumwater Dam on the Wenatchee River in order to produce 200,000 sub-yearling sockeye salmon (mitigation goal). Adults are transferred to net pens in Wenatchee Lake, where they are held through spawning. Egg incubation and early rearing occur at the Eastbank Hatchery.

Sub-yearlings are transferred in the summer (currently July) to Lake Wenatchee net pens where they continue rearing until their release in the fall. From this production, less than 100 to 2,500 hatchery-produced adults typically return to the lake. Between 1989 and 2005, natural-origin adult returns averaged 15,000 fish.

This program is adaptively managed, and some operational changes have been made (e.g., juvenile release modifications); however, it is unclear whether these changes have provided a benefit to the population (e.g., current hatchery fish replacement rates are not consistently greater than 1.0).

As currently operated, the program is consistent with the standards for a Primary population (PNI greater than 0.67).

Recommendations

The HSRG recommends that managers continue to monitor the relationship between hatchery replacement rates and natural replacement rates. Managers should improve methods and techniques used to assess juvenile out-migration run size from the lake as well as adult escapement in spawning tributaries.

Once new information from monitoring and evaluation becomes available, managers should assess needed changes to the program, including discontinuing the program if the performance is less than what would occur naturally.

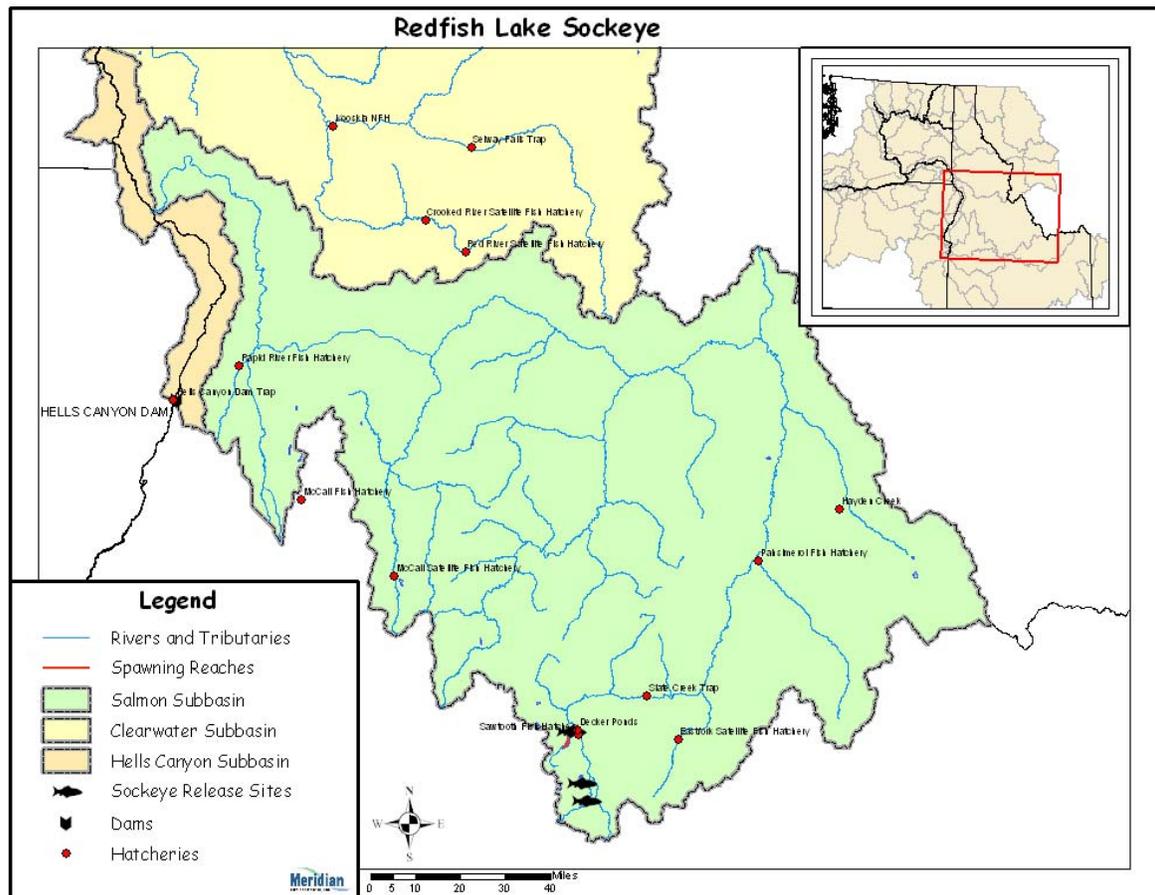
Table 1. Results of HSRG analysis of current condition and HSRG Solution for Wenatchee Sockeye. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|------|---------|----------|---------|------------------|
| Current | Int-Cons | 211.7 | 0% | 0% | 0.4% | 1.00 | 14,803 | 10.0 | - | - |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0.0% | 1.00 | 15,030 | 10.0 | - | - |
| HSRG Solution | Int-Cons | 211.7 | 0% | 0% | 0.4% | 1.00 | 14,803 | 10.0 | - | - |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Int-Cons | 211.7 | 0% | 0% | 0.3% | 1.00 | 16,473 | 11.0 | - | - |
| | | | | | | | | | | |

Hatchery Scientific Review Group Review and Recommendations

Salmon Redfish Sockeye Population and Related Hatchery Programs

January 31, 2009



1 Salmon Redfish Sockeye

This population is considered part of the Snake River Sockeye ESU that is classified as Endangered under the Endangered Species Act. Snake River sockeye salmon were listed as an Evolutionarily Significant Unit (ESU) due to their uniqueness as the southern most spawning population that also travels the farthest inland (> 1,400 km) and to the highest elevation (> 1,980 m) of any sockeye salmon population in the world. At the time of listing, Redfish Lake, located in the upper Salmon River subbasin, contained the only remaining population of sockeye salmon in the Snake River Basin. Historically, it was estimated that as many as 40,000 sockeye returned to the Stanley River subbasin each year (NPCC 2004).

The Interior Columbia Technical Recovery Team (ICTRT) designated at least three historical populations within the Stanley Lakes Basin: Redfish Lake (including Little Redfish), Alturas Lake, and Stanley Lake. The Redfish Lake sockeye population includes both anadromous and residualized sockeye that spawn synchronously with the anadromous fish. In addition, two more lakes - Pettit Lake and Yellowbelly Lake - may have supported independent populations; however, currently available information did not allow the ICTRT to determine their status with certainty. The ICTRT therefore regarded them as potential populations.

In addition, three other lakes or groups of lakes in the Snake River drainage supported sockeye populations: Warm Lake (in the South Fork Salmon drainage); Payette, Upper Payette and Little Payette Lakes (Payette River drainage); and Wallowa Lake (Grande Ronde drainage). The distance between these lakes or groups of lakes is consistent with observed distances between extant ESUs of lake-spawning sockeye, suggesting that each of these groups would likely have been separate major population groups and may have been separate ESUs.

2 Current Conditions

The Redfish Lake population includes all the fish in this ESU. Less than 200 adults have returned to the subbasin since 1987 (NPCC 2004) and the number of wild sockeye smolts emigrating from Redfish Lake is less than 5,000 in most years. However, an effort is underway with support to increase the number of smolts released annually by this program. Over the last three years, smolt releases have average approximately 100,000 fish. The expansion of smolt releases is supported with language in the 2008 Federal Columbia River Power System Biological Opinion and the 2008 Fish Accords signed by Bonneville Power Administration and the State of Idaho. Low out-of-basin survival is the primary limiting factor for this population.

Juvenile sockeye rear one or two years in the lake and then emigrate to the ocean in April and May. Adults arrive back in the Stanley subbasin between mid-July and early September.

A captive broodstock hatchery program was initiated in 1991 to safeguard the remnant population (conserve the genome) and begin a population rebuilding process. All 16 anadromous adults that returned to Redfish Lake in the 1990s (1992 through 1998) were trapped and incorporated in the broodstock program. Other “founders” included residual sockeye salmon trapped in Redfish Lake and several hundred outmigrants trapped while emigrating from Redfish Lake.

The captive broodstock program maintains a safety net at the IDFG Eagle Hatchery in Eagle, Idaho and at NOAA hatcheries in Puget Sound (Manchester and Burley Creek). The program replaces the broodstock annually in addition to producing eggs and fish for reintroduction to natal waters (Redfish, Alturas, and Pettit lakes).

The Shoshone-Bannock Tribes operate a habitat monitoring and improvement project in project nursery lakes. This includes a whole-lake fertilization program.

2.1 Current Population Status and Goals

This section describes the current population, status, and goals for the natural population.

- ESA Status: Snake River Sockeye are listed as Endangered under ESA.
- Population Description: Small remnant population near extinction. The majority of production is from the captive broodstock program.
- Recovery Goal for Abundance: The interim recovery standards established by NOAA are 1,000 naturally-produced adults returning to Redfish Lake and 500 naturally-produced adults returning to two additional lakes (presumably Alturas and Pettit lakes).
- Productivity Improvement Expectation: Not available
- Habitat Productivity and Capacity: Productivity: 0.14; Capacity: 10,000

2.2 Current Hatchery Programs Affecting this Population

A captive broodstock program was developed in 1991 to protect the remnant population. A full-term captive broodstock is maintained at the IDFG Eagle Fish Hatchery and at NOAA's Burley Creek Fish Hatchery and Manchester Marine Lab in Puget Sound. Every effort is made to maintain the genetic diversity of this population and to avoid inbreeding. Annually, captive adults are spawned based on a genetic spawning matrix established to prioritize spawn crosses that avoid inbreeding. Anadromous adults captured at adult weirs in the Stanley subbasin may be incorporated in spawning designs. Maturation of adult broodstock has occurred primarily at age three. Egg survival to the eyed-stage of development has ranged from 0% to 99% (by individual female) with overall eye-up averaging greater than 60% (for hatchery-origin females). Survival of broodstock in the hatchery has been excellent (approximately 80% from hatch to spawning).

Annually, the program produces eggs and fish for reintroduction to natal waters. The program has followed a spread-the-risk reintroduction strategy while researchers work to determine the most successful options. Additional efforts are underway to locate and acquire additional production rearing space for this program.

Current production goals for the program include: 50,000 eyed-eggs planted in egg boxes in Pettit Lake; 120,000 pre-smolts planted in Redfish, Alturas, and Pettit lakes (combined release); and 80,000 smolts planted in the outlet of Redfish Lake and in the upper Salmon River immediately upstream of the Sawtooth Fish Hatchery (equal split). Additionally, the program produces up to 500 full-term hatchery adults that are planted primarily in Redfish Lake for natural spawning.

Estimated number of hatchery strays affecting this population:

- Hatchery strays from integrated in-basin programs: 100%
- Hatchery strays from in-basin segregated and out-of-basin hatchery programs: 0 fish.

3 HSRG Review

The HSRG has developed guidelines for minimal conditions that must be met for each type of program as a function of the biological significance of the natural populations they affect. For populations of the highest biological significance, referred to as Primary, the proportion of effective hatchery-origin spawners (pHOS) should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population. For integrated populations, the proportion of natural-origin adults in the broodstock should exceed pHOS by at least a factor of two, corresponding to a proportionate natural influence (PNI) value of 0.67 or greater. For Contributing populations, the corresponding guidelines are: pHOS less than 10% or PNI greater than 0.5. It is important to note that these represent minimal conditions, not targets. For example, the potential for fitness loss when effective pHOS is 5% is significantly greater than it would be at 3%. For Stabilizing populations, we assume the current pHOS or PNI would be maintained.

The HSRG analyzed the current condition and a range of hatchery management options for this population, including the effect of removing all hatchery influence, and arrived at one or more proposed solutions intended to address the manager's goals consistent with the HSRG guidelines for Primary, Contributing, and Stabilizing populations. The solution included in the cumulative analysis is the last option described in the Observations and Recommendation box below.

In order to highlight the importance of the environmental context, two habitat scenarios were considered: current conditions and a hypothetical 10% habitat quality improvement.

See HSRG Observations and Recommendations in the box below for more information.

3.1 Effect on Population of Removing Hatchery

The No Hatchery scenario is intended to look at the potential of the natural population absent all hatchery effects with projected improved fish passage survival in the Snake and Columbia mainstem (FCRPS Biological Opinion May 5, 2008).

Our analysis estimated that Adjusted Productivity (with harvest and fitness factor effects from AHA) would be increase from 0.07 to 0.14. Average abundance of natural-origin spawners (NOS) would decrease from approximately 15 fish to approximately 0 fish. The harvest contribution of the natural and hatchery populations would go from approximately 13 fish to approximately 0 fish.

3.2 HSRG Observations/Recommendations

In the Observation and Recommendation box below we describe elements of the current situation (Observations) that were important to evaluate the natural population and where applicable, the hatchery program(s) affecting that population. We also describe a solution (Recommendations) that appeared to be consistent with manager's goals; however, this is not the only solution. In some cases more than one solution is described.

Summary results of this analysis are presented in Table 1. The adjusted productivity values reported for each alternative incorporates all factors affecting productivity (i.e., habitat quality, hatchery fitness effects, and harvest rates).

Observations

Managers have identified a strategy for Redfish Lake sockeye salmon that emphasizes maintaining existing natural spawning populations, and using hatchery-origin sockeye salmon in an attempt to augment natural production.

A full-term captive broodstock is maintained at the IDFG Eagle Fish Hatchery and at NOAA's Burley Creek Fish Hatchery and the Manchester Research Station in Puget Sound. Spawning occurs annually at these locations and is guided by an inbreeding avoidance matrix developed at the IDFG genetics lab. Every effort is made to spawn all maturing adults and to equalize their representation in subsequent generations (within the captive safety net).

Annually, the program replaces the captive broodstock at IDFG and NOAA facilities by selecting eggs from all spawn crosses and by equalizing individual representation. The program also produces eggs and fish for reintroduction to natal waters. Following a spread-the-risk reintroduction strategy, the current production goals for the program include: 50,000 eyed-eggs planted in egg boxes in Pettit Lake; 120,000 pre-smolts planted in Redfish, Alturas, and Pettit lakes (combined release); and 80,000 smolts planted in the outlet of Redfish Lake and in the upper Salmon River immediately upstream of the Sawtooth Fish Hatchery (equal split). Additionally, the program produces up to 500 full-term hatchery adults that are planted primarily in Redfish Lake for natural spawning. Currently a large proportion of the smolt releases have a ventral fin clip applied. Reduced survival from ventral fin clipping is well-identified in the literature.

Efforts are underway to locate and acquire additional production rearing space for planned increases in the size of this program. Recent modifications were also made to the IDFG and NOAA broodstock stations. Over the last three years, program smolt releases have increased from an average of 10,000 to 20,000 annually to over 100,000. In 2008, over 600 anadromous adults returned to the Sawtooth Valley, ID.

Recommendations

The HSRG concurs with the decision initiated by managers to increase smolt releases from the program. This action to increase smolt production (500,000 to 1 million fish) is identified in the 2008 FCRPS Biological Opinion. Increased smolt releases should produce increased anadromous adult returns that will be incorporated into hatchery broodstock or released to the habitat to increase natural production.

Additionally, the HSRG recommends that managers pursue other actions that have the potential to increase the availability of anadromous adults. One option is to capture adult Snake River sockeye salmon at Lower Granite Dam for transport back to Idaho. This action is also identified in the 2008 FCRPS Biological Opinion.

In addition to the above, the HSRG recommends that managers implement a downstream anadromous release and adult capture program at an appropriate lower Columbia River hatchery integrated with the expanded upriver program. This option would generate a more consistent return of anadromous sockeye salmon that could be spawned to augment the production of eggs and juveniles for incorporation into the suite of release strategies.

The overarching goal for implementing any or all of the above strategies is to return greater numbers of anadromous adults that could be used selectively in spawning designs

or released to the habitat to address concerns over loss of fitness in this closed population. The HSRG also recommends that managers tag/mark all fish released by this program to facilitate subsequent collection and identification. The HSRG recommends finding alternative means of identifying fish and discontinuing the practice of ventral fin clipping.

Table 1. Results of HSRG analysis of current condition and HSRG Solution for Salmon -Redfish Sockeye. The light green row indicates the natural population and yellow indicates the segregated hatchery population, if applicable. A 10% habitat improvement is applied to the HSRG Solution to evaluate the additional effect of improved habitat towards conservation objectives.

| Alternative | Type and Purpose | Prog Size (/1000) | HOR Recapture | Additional Weir Efficiency | Effective pHOS | PNI | NOS Esc | Adj Prod | Harvest | Hatchery Surplus |
|-----------------------------------|------------------|-------------------|---------------|----------------------------|----------------|-----|---------|----------|---------|------------------|
| Current | Seg-Cons | 151.7 | 0% | 0% | 92% | 0.0 | 15 | 0.07 | 13 | 0 |
| | | | | | | | | | | |
| No Hatchery | None None | - | 0% | 0% | 0% | 1.0 | 0 | 0.14 | 0 | - |
| HSRG Solution | Seg-Cons | 749.9 | 75% | 0% | 92% | 0.0 | 28 | 0.07 | 90 | 316 |
| | | | | | | | | | | |
| HSRG Solution w/ Improved Habitat | Seg-Cons | 749.9 | 75% | 0% | 91% | 0.0 | 31 | 0.08 | 90 | 316 |
| | | | | | | | | | | |